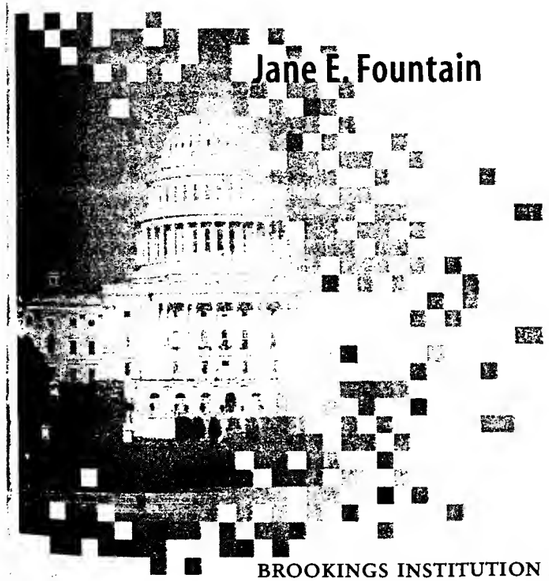
Building the Virtual State

Information Technology and Institutional Change

Jane E. Fountain



BROOKINGS INSTITUTION PRESS
Washington, D.C.

Contents

Preface ix

PART ONE

Theory

CHAPTER ONE
Introduction 3

CHAPTER TWO
Leveraging Cyberspace to Reinvent Government 18

CHAPTER THREE
Networked Computing 31

CHAPTER FOUR
Bureaucracy 44

CHAPTER FIVE
Interorganizational Networks 64

CHAPTER SIX
Enacting Technology: An Institutional Perspective 83

PART TWO

Practice

CHAPTER SEVEN
The International Trade Data System 107

CHAPTER EIGHT
Enacting the ITDS 129

CHAPTER NINE
A Virtual Agency for Business 147

CHAPTER TEN
Command and Control in Cyberspace 167

CHAPTER ELEVEN
Conclusions 193

Notes 207

Index 243

CHAPTER ONE

Introduction

THIS BOOK DEALS equally with the Internet and with institutions, the latter a dominant concern of political and social thought since antiquity. In governments around the globe, from Indianapolis to India, from San Francisco to Singapore, from Chile to China, policymakers view the Internet either as a force to increase the responsiveness of government to its citizens or as a means to further empower the state. In developing nations, new wireless information and communication technologies signal an unprecedented opportunity to hasten the pace of development and connection to the developed world. A marked increase in the growth of transnational financial, legal, and regulatory systems—made feasible by the Internet—has raised serious debate about the future, the location, and the structures of governance. In authoritarian regimes, the Internet threatens domination by the state over information and communication but at the same time, paradoxically, serves as an instrument of consummate state surveillance and control over society. The choices we face in the present regarding the use of digital tools and the institutional arrangements in which they are embedded will influence the way governments work around the globe during the next century and beyond.

The analytical framework I advance extends and refines institutional theory to encompass recent fundamental developments in information

technologies. This intellectual territory lies virtually uncharted by institutional theorists in political science, sociology, and economics or in the related practical fields within public policy and management and organizational behavior. As the use of the Internet unfolds, questions central to institutional thought persist with increasing force. How are bureaucratic policymakers using networked computing? Are they negotiating new institutional arrangements as a consequence? To what extent and in what ways are they constrained by current institutional arrangements? What extensions of institutional theory are necessary to take account of fundamental change in organizational communication, coordination, and control? My purpose is to advance theory to inform answers to these questions. By clarifying and extending concepts and relationships, central tasks of theory-building, this book also contributes to practice.

Enter the Virtual State

A key phase of the Internet's impressive growth began in 1993, coinciding with the initial period of a major government reform effort, the National Performance Review, led by Vice President Al Gore. Having focused initially on developing regulatory and legal regimes conducive to e-commerce, the government then turned to the task of building digital government, in part through the strategy of creating virtual agencies. The virtual agency, following the web portal model used in the economy, is organized by client—for example, students, seniors, small-business owners, or veterans; each site is designed to provide all of the government's services and information from any agency as well as links to relevant organizations outside government. Web portals, extending to government the business concept of 7 x 24 x 365 (being available seven days a week, twenty-four hours a day, 365 days a year), would restructure the relationship between state and citizen to be simpler, more interactive, and more efficient. A virtual state (my term) is a government that is organized increasingly in terms of virtual agencies, cross-agency and public-private networks whose structure and capacity depend on the Internet and web.

Cost savings, although sizable in many instances, have not been emphasized during these early efforts. Yet they are potentially enormous.[1] The U.S. Department of Commerce estimates that the cost to the government of processing a payment would be reduced between $1.65 to $2.70 for traditional administrative processing and from $0.60 to $1.00 for web-based processing.[2] Public agencies process hundreds of millions of paper-based transactions annually in the form of bill payments and document submissions and could achieve similar efficiencies across a range of transactions. The Department of Education services approximately 20 million student loan accounts. It pays a contract fee of twelve dollars per toll-free telephone call for access to student account information in the department's central processing system, which stores the database of Title IV student aid, student loan origination, and aid disbursement to schools. Web-based queries to this database cost only a few cents.[3]

Movement from paper-based to web-based processing of documents and payments typically generates administrative cost savings of roughly 50 percent—more for highly complex transactions. This figure ignores additional savings of money, time, travel, and effort to citizens and intermediate institutions. The sum of the following transactions with government—birth registrations; elementary, secondary, and college enrollment; motor vehicle registration and inspection; voter registration; construction permits for new housing; and patent and trademark applications—was nearly $443 million per year in 1999, according to the U.S. Census Bureau.[4] The sheer volume of government transactions suggests the enormous savings electronic transaction processing alone could provide.

Forrester Research, a private research firm, predicts that by 2006 governments at the local, state, and federal levels will receive 15 percent of their total collections, or $602 billion, over the web.[5] This figure is significant not only for its impressive size, but also because private vendors and e-government providers typically charge a percentage fee for each transaction. Thus digitizing government can create a particularly lucrative new market. If no other pressure for electronic government existed, the market potential for businesses alone would move digitization forward. By the summer of 2000, nearly every federal agency and most state and larger local governments provided information and some services on the web. The median number of web-based state government services was four. Forms may be downloaded and taxes filed electronically, professional licenses obtained or renewed digitally, and state employment databases, sex offender registries, and government contracts searched online.[6]

The web's potential to support more efficient procurement means government benefits financially and administratively. In fiscal year 1999, U.S. government expenditures at all levels for procurement equaled $584 billion, of which $177 billion was federal defense spending.[7] Many large firms using web-based procurement to put supply chains on the web gain transparency and improve markets. Some have reported savings of 20 percent

annually from use of the web for business-to-business exchange, although more recent estimates are smaller.[8] Similar government savings are estimated to yield nearly $117 billion per year.[9]

In addition to the development of web-based government-to-citizen (G2C) services and government-to-business (G2B) digital procurement processes, development of government-to-government (G2G) connectivity promises to yield significant benefits. Agency autonomy, competition, and lack of interoperability ("stovepipes") have long hampered coordination, slowed communication, and diminished opportunities for joint policy problem-solving in government. Open standards and protocols on the Internet allow all computers to be connected, resulting in the remarkable connectivity, size, range, and richness of the web. Yet the technical infrastructure for linking the computers of the government is no substitute for the institutional infrastructure required to support coordinated practices, procedures, cultures, incentives, and a range of organizational, social, and political rule systems that guide behavior and structure agencies.

The major challenge for government is not the development of web-based G2C transactions but reorganizing and restructuring the institutional arrangements in which those transactions are embedded. Policymakers have barely contemplated integration or reorganization behind the web, in the bricks and mortar of government. Moreover, it is clear that the current information infrastructure in most government agencies could not support e-government at any appreciable level, meaning that the Internet alone cannot interconnect agencies and the public. The initial euphoria that greeted e-commerce has been replaced with a growing awareness of the painstaking and painful organizational and industry restructuring that will be necessary to further exploit the coordination, control, and communication potential of the Internet. Government is following a similar trajectory. Unlike private firms, however, government reorganization is far more difficult and highly political because of the embeddedness of agencies in long-standing institutions. The reorganization of government as a consequence of the Internet signals an institutional transformation of the American state.

These reform challenges demand scholarly inquiry. This book seeks to break new ground by incorporating networked computing into institutional perspectives on governance and organizations. The intellectual precursors of this study are firmly situated in three broad streams of theory and research rooted primarily in political science, organizational and economic sociology, and studies of technology and organization.

The first stream, the study of governance, has been inextricably linked to institutions since antiquity. Robert Dahl observed: "That the character of a regime and the qualities of its people are somehow related has been a commonplace of political philosophy since the Greeks."[10] Aristotle argued that effective democratic institutions are intimately connected to the social and economic development of the demos. Plato, in the *Republic*, noted that similar institutions of governance vary depending upon the cultural characteristics of the citizenry. In the mid-nineteenth century, as constitution building in the nation-states gained impetus, John Stuart Mill sought to devise the institutional structures and processes of representative government that would protect individual rights and interests.[11]

More recently, interest in institutions has encompassed a range of overlapping and, at times, competing research programs.[12] Robert Putnam has furthered our understanding of the relationship among democratic institutions, politics, and social capital.[13] James March and Johan Olsen have contributed to institutional thought by delineating both rational choice and boundedly rational organizational bases of politics.[14] Robert Keohane and Joseph Nye have argued that realism in international relations fails to account for the effects of complex interdependence, international institutions, and the importance of "soft power."[15] International relations scholars have long examined the underpinnings of international regimes that govern in the absence of overarching authority.[16] Historical and comparative studies of government institutions, particularly those that examine the autonomy, capacity, and development of the state, have emphasized the political conflict and negotiation underlying institutional change and development as well as the strong effects on development of history, culture, and structural inertia.[17]

Other political scientists and sociologists have used an institutional lens to examine individual and organizational relationships and behavior in the policymaking process.[18] Researchers in this stream tend to focus on policymaking as it is actually carried out by individual and organizational actors rather than on more formal models of legislative or interest group behavior.[19] As Hugh Heclo observed, political sociologists have attended to the social relationships and social conditions that lead to public policies and the effects those policies have on social structure. Political scientists cast their analytical gaze on the political relationships, political forces, and political effects of policy. Yet public managers and other government actors are both social and political.[20] The analytic distinctions are imposed on the phenomena. The organizational, and more structural, variant of

this mode of inquiry is perhaps best exemplified by Edward Laumann and David Knoke in *The Organizational State*, which views policymaking from the perspective of constellations, or networks, of public, private, and nonprofit organizations.

The second broad stream from which this book draws is the new institutionalism in organizational theory and sociology.[21] At the turn of the twentieth century, Émile Durkheim, the founder of sociology, defined it as "the science of institutions, of their genesis and of their functioning."[22] John Meyer, Richard Scott, and Brian Rowan have explained the roles of symbols and rituals in institutions and their relationship to legitimacy.[23] Paul DiMaggio and Walter Powell accounted for similarities in organizational forms and practices within organizational fields not as the result of rational choice but more often as the product of institutional isomorphism, processes by which organizations in a given field conform to normative influences, mimic others, or are coerced by powerful actors in their environments to adopt practices.[24] Other sociologists incorporate self-interest and incentives into institutional analysis to construct a choice-within-constraints framework that overlaps substantially with the new institutional economics.[25]

Mark Granovetter, in a seminal article published in 1985, argued that economic action is embedded in ongoing social structures and social relations.[26] His clear conceptual account of embeddedness in institutional and economic life reinvigorated a long-standing but dormant line of research in economic sociology. Embeddedness, according to Granovetter, affects both individual action and institutions. His approach sought a "third way" between "an atomized, undersocialized conception of human action [developed] . . . in the utilitarian tradition" and an oversocialized conception of the individual as one who has internalized norms and obligations to such an extent that terms such as "interests" and "choice" lose meaning.[27] Subsequent research has further developed the antecedents, characteristics, and outcomes of embedded network relationships, explored the mechanisms by which networks and embeddedness influence economic behavior, and explored the links between institutions and networks.[28]

The third major stream of research informing this book considers the relationship between information technologies and organizations. Max Weber recognized clearly the rapid development of bureaucracy in the nineteenth century as a response to the industrial revolution. Bureaucracy was needed to control decentralized, complex operations and to coordinate rail transport. He explained bureaucracy as a technology of control

through its structuring of information into cases and channels, its strict reliance on impersonal relations, and inevitable tendency toward rationalization.[29] More recently, Alfred Chandler, the business historian, traced the evolution of the modern corporate form and its practices.[30] James Beniger has placed the "information revolution" in more than a century of efforts to gain speed and control over material processing. He argued that developments in computing typically respond to crises of control.[31] JoAnne Yates traces the dominant modes of managerial communication in complex organizations to their roots between 1850 and 1920 as written, formal communication subsumed earlier, less formal means.[32] Stephen Barley has explored the relationship between information technology (IT) and the organization of work.[33] Other researchers also have focused on the social and structural mechanisms by which individuals and organizations use new information technologies and on the effects of information technology on organizations and the design of work.[34]

This book seeks to integrate and to refine and extend research in these three broad streams. With few exceptions, little detailed inquiry on embeddedness and the role of networks has been conducted on government organizations and institutions. Laurence O'Toole has observed that public management "increasingly takes place in settings of networked actors. . . . Yet the standard writings to which most administrators turn for advice to improve performance devote relatively little attention to acting effectively in such situations."[35] Networked arrangements in government are prominent and likely to increase. The federal budget appropriates only a small proportion of the total to single-agency programs; nearly all major federal policies require a constellation of public, private, and nonprofit organizations.[36] Researchers have used the term "the hollow state" to denote that government increasingly takes place in the private and nonprofit sectors.[37] This book seeks to extend research on embeddedness and networks to better align research with current phenomena.

Studies of technology and organization have remained persistently ignored by social and policy scientists except those with an explicit interest in technology. Information technology has yet to be theorized in the institutional perspective or in other central paradigms of political science and sociology with the exception of communications studies. Although theories of technology adoption and innovation have a long history, particularly in economics, the ways in which information technologies interact with behavior, ongoing social relations, and organizational structure and process have yet to be adequately conceptualized and remain the province

of research programs relatively isolated from the mainstream. As Heclo wrote in a different context, "One of the things most astonishing to posterity about our own times will be not how much we understood but how much we took for granted."[38] A century from now, social and policy scientists will look back with amusement and no small amount of condescension at the glacial pace with which social scientists moved to consider fundamental changes in information processing and their implications.

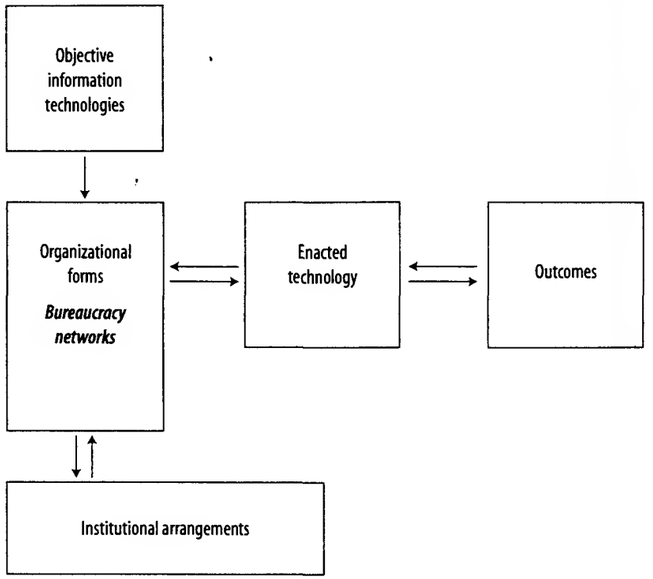
Enacting Technology

Institutional theories provide accounts of the constraints that institutions impose on action. These theories explain stability and coherence in collective and individual action but tend to leave essential and pressing questions unaddressed. How do institutions change? If institutions constrain action, how and why do only some actors and some organizations conform? How does technology enter institutional theory as a variable? By what mechanisms are institutions affected by fundamental changes in information processing and communication? In what ways do enactments of information technology strengthen or weaken constraints posed by institutions?

The analytical framework I advance is introduced here in simplified form in figure 1-1. Its elaboration and support form the substance of this book. This framework contributes to institutional theories by treating information technologies endogenously. Information technologies are transformed in the process of being designed and used. I distinguish *objective technology* from what I call *enacted technology*. Objective technology includes the Internet, other digital telecommunications, hardware, and software; enacted technology consists of the perceptions of users as well as designs and uses in particular settings. The Internet is merely a telecommunications spinal cord that computers connect with throughout the globe. It is a breathtaking achievement, but its force as an agent of change lies in the fact that it reduces some communication and coordination costs to nearly zero and affords an enormous array of new uses.

Information technologies differ from production or manufacturing technologies, the referent for "technology" in most institutional and organization theories. Information technologies are much more decomposable, flexible, and open to myriad designs and uses. Industrial technologies are brawn. Information technologies are brain and nervous system. Industrial technologies replace arms, hands, and muscle. Information technologies

FIGURE 1-1. Technology Enactment: A Basic Framework



replace communication, thinking, and calculation. They are far more complex in their application, use, influence, and effect. Institutional theory has not yet accounted for information technologies and their role.

Institutional and organizational arrangements mediate technology enactment. In this framework, organizational arrangements refer to bureaucracy and interorganizational networks, both of which are dissected in later chapters.

Political scientists often use the term *institution* as a rough synonym for government. Many social scientists, however, distinguish between organizations and institutions, although the analytical distinction is blurred. Organizations are technical instruments in which products or services are produced and exchanged in a market and in which rewards are given for "effective and efficient control of the work process."[39] In contrast, institutions generate rules and requirements to which actors and organizations

must conform if they are to receive support and be deemed legitimate in their authorizing environment. Organizational environments reward effectiveness, efficiency, and control over production. Institutional environments reward normative requirements for appropriateness and legitimacy and, in some cases, conformity to procedure, presentation, symbols, and rhetoric. Government agencies possess both organizational and institutional elements and must function in both environments. They are expected to be efficient and effective in their core activities but operate in a legislative, oversight, and political environment that requires conformity to a range of requirements that have little or nothing to do with economic output. Institutional arrangements range from micro-level elements in organizations to macro structures in the state and society.

Information technologies and organizational/institutional arrangements are connected reciprocally. Both function in this framework as dependent and independent variables. Each one has causal effects on the other. Institutions and organizations shape the enactment of information technology. Technology, in turn, may reshape organizations and institutions to better conform to its logic. New information technologies are enacted—made sense of, designed, and used (when they are used)—through the mediation of existing organizational and institutional arrangements with their own internal logics or tendencies. These multiple logics are embedded in operating routines, performance programs, bureaucratic politics, norms, cultural beliefs, and social networks.

Therefore, outcomes are unpredictable and variable in their rational, political, and social features. The effects of the Internet on government will be played out in unexpected ways, profoundly influenced by organizational, political, and institutional logics. In many instances the Internet does not lead to institutional transformation but is enacted to strengthen the status quo. Consider the use of information systems that speed up the processing of information, monitor employees more closely, and produce detailed monthly reports of activities. Little has changed structurally in this scenario. The same processes simply run faster and employees operate under tighter controls. In other instances technology is used explicitly to create change. Information technologies are not so much adopted or implemented as they are enacted by decisionmakers.

Reciprocal effects between technology and institutions are not sequential and direct but complex and highly interdependent, forming a new kind of virtual politics. When different logics intersect or conflict, the results are unpredictable. A high level of uncertainty, stemming in part from

the pace of technological change, contributes to the production of unanticipated consequences and externalities in positive and negative variants. The negotiations, conflicts, and struggles among bureaucratic policymakers constitute the building of the virtual state. The outcomes of these struggles will shape its contours.

In most accounts of information technology and its influence, the causal mechanism that connects technology and institution is direct:

information technology → predictable institutional change

In these accounts, networked computing leads to a set of predictable changes, including flattened hierarchies, greater use of cross-functional teams, and more collaborative cultures; and more permeable organizational boundaries lead to greater use of interorganizational networks.[40] However, at least two decades of research on technology and organization demonstrate conclusively that these predictions, while possessing a certain technological logic, are not borne out in general.[41] To cite one example, Harold Leavitt and Thomas Whisler predicted in the 1950s that information technology would lead to the disappearance of middle-management layers.[42] It was clear even fifty years ago that automation could easily accomplish many of the routine tasks performed by middle managers. Yet the inarguable logic of IT did not lead to this change until the mid-1980s, when organizations began deep restructuring efforts in the face of an economic downturn, increased global competition, and a political culture that allowed massive downsizing in the economy. As Fernand Braudel observed about the industrial revolution, the technologies for such a revolution were in place for many years and in several countries. They sparked a "revolution" in Great Britain when economic necessity and institutional arrangements interacted synergistically with technology.[43]

An institutional perspective alerts us to the fact that government is likely to use the Internet differently than firms in the economy use it. The development of the virtual state is not likely to resemble the growth of electronic commerce. Government reform is qualitatively different from restructuring in firms and industries. Ironically, the substantial efficiency gains driving the development of e-commerce and industry change are disincentives for bureaucrats to use the Internet in government. Whereas dramatic efficiency gains and cost savings in the economy are rewarded through profits, promotions, stock price increases, and market share, similar gains in government are rewarded with budget cuts, staff reductions, loss of resources, and consolidation of programs. In this instance, incentives

and rewards in the institutions of government are the obverse of those in the market. During the current first wave of digital government euphoria, when information and services are beginning to migrate to the web, efficiency gains and their political implications are not apparent. But during the next wave, when government-to-government channels develop further, bureaucratic decisionmakers will rapidly experience the perversity of incentives for institutional transformation.

Over the next decade, government decisionmakers will make important choices about the development of electronic government. Deliberate and informed decisions regarding alternative designs and uses of technology and institutional arrangements will require clarifications of the challenges and implications. Management and digital government consultants, eager to exploit the huge government market for digital tools, have already predicted that Congress will have to force the restructuring of agencies in order for government to take advantage of the benefits of the Internet and avoid bureaucratic gridlock.[44] These predictions suggest the pressure that governments might face to keep pace with changes in the economy. Without a conceptual framework to guide analysis and practice, researchers might simply document internecine bureaucratic struggles alternately with cases of dramatic innovation rather than helping decisionmakers to structure decisions and their consequences.

The Structure of the Book

The analytical framework summarized here is an outline for the chapters that follow. The study is grounded in the experience of the federal government, yet its lessons apply to state and local governments as well as to other democratic institutions around the globe. Part I of the book, which focuses on theory, dissects and analyzes organizational and institutional structures. Chapter 2 provides the historical and political context of national government reform in the United States during the National Performance Review (later called the National Partnership for Reinventing Government). Chapter 3 analyzes the chief properties of networked computing and its current uses in American government. Chapter 4 takes up bureaucracy, whose demise has been greatly exaggerated, and asks whether Max Weber would recognize the structures now called postbureaucratic. The network form and its characteristics are the subject of Chapter 5. Many experts have argued that networked governance replaces and

supersedes bureaucracy. Whether or not this is true, the network form is growing in use and importance. Chapter 6, the central theoretical chapter, addresses institutions and presents a detailed discussion of the technology enactment framework and some of the initial propositions derived from it.

Part II focuses on practice. Three detailed case studies examine the ways in which bureaucratic policymakers—senior civil servants and appointees—are enacting technology for public purposes. Government actors in the bureaucracy, more than any other group, will construct or reconstruct the American state in an information age. When institutional arrangements and technology affect one another, they do so as a consequence of the actions and decisions of political actors. Their engagement with the structure of government and the policymaking system—and their role in making sense of and integrating new technologies into the nervous system of government—dwarfs that of any other group.

At the beginning of the Clinton administration, government reform efforts emphasized technology as a catalyst for modernization and the importance of bottom-up change as a way to revitalize the bureaucracy. Chapters 7 and 8 examine the development of the International Trade Data System, a governmentwide G2G and G2B system for processing international trade. The case scrutinizes the relationship between state and economy as international supply chain integration increases the volume and pace of the movement of goods and services across international borders. The International Trade Data System represents the kind of restructuring likely for G2G channels to be developed. If the state is to adequately regulate a global economy in which agricultural products, pharmaceuticals, assembled goods, and inputs cross international borders with impressive frequency, it has little choice but to develop information systems that integrate and facilitate the work of the nearly sixty-three separate agencies with partial jurisdiction over trade.

Far less ambitious than a governmentwide information system, a G2C web portal integrates the information and services of "bricks and mortar" agencies in cyberspace. Presented in Chapter 9, the development of the U.S. Business Advisor, the nation's first federal government web portal, brought together for the first time information and services from several agencies that serve or regulate business. Small-business owners could search one website for all regulations, laws, and information enforced or available through the government. The Business Advisor provides online approval for small-business loans up to $150,000, online tutorials, and indexes of export opportunities and regulations from around the globe. This case

study explores the institutional and political challenges of building such virtual agencies.

Well before the Internet was publicly accessible, large organizations used intranets, including shared databases, e-mail, and other digital tools. No part of government pursued this path more vigorously than the army, in its efforts to modernize after the Vietnam War. In Chapter 10, I examine the user-as-developer approach followed in the Ninth Infantry Division, once the high-technology testbed for the tactical army, to develop automated battlefield management systems. The unanticipated consequences of technology enactment in the army provide surprisingly relevant and timely lessons for civilian government.

These cases were not selected at random and are not intended to be representative of all government technology efforts. They were chosen as examples of the intricate interdependence between individual action, institutional structure and practice, and networked computing. They allowed me to observe firsthand the processes by which government actors learn to use new technologies with transformative potential. The dramatic surge of activity following the release of the Internet for public use provided an unparalleled opportunity to observe a natural experiment in institutional transformation. I "test" propositions against empirical evidence to generate theory rather than to evaluate predictive theory. These cases represent cutting-edge experiments that were expected to achieve dramatically important results. In all instances, senior-level support was strong. The size of the effort and the political backdrop varies with each case, as does the level and type of interorganizational integration.The cases illustrate the sorts of challenges that will become more pressing and frequent as governments around the globe move beyond simply putting information and services on the web to the more complex challenges of institutional transformation.

Why is this inquiry important? In the face of momentous social transformation, a curious silence echoes through much of the academy. A review of the first-tier journals in organization theory and political science yields an almost imperceptible nod to the Internet. It is as if an information revolution were not taking place among experts on organizations and institutions. A troubling gap is growing between the importance of the Internet and its effects on government and society and the attention of social scientists to this empirical phenomenon. Social scientists, with few exceptions, have barely taken account of fundamental changes in communication, information processing, coordination, and control enabled by networked computing. It may be that the din of popular attention to the

Internet produces an understandable antipathy toward the topic among social scientists. Social science should avoid the trendy in order to focus on questions of deep and enduring concern to society. Yet the information revolution represents a fundamental, deep, and disjunctive shift in society, economy, and government. It is a revolution in its effect, not in its speed. This book fills a gap rather than standing in opposition to well-developed approaches to the topic. There are no well-developed approaches.

Evolutionary theories tell us that individuals will find the most efficient and best-suited forms of the Internet and its use in government through a competitive process that will separate the good ideas from the bad. If this is so, policymakers have only to continue muddling through until the separation process occurs. Such wishful thinking, though appealing, is highly problematic. Rational-actor models tell us that individuals will find the most efficient uses of the Internet in government, and that better performance and utility will result. If efficiency were the only, or even the chief, criterion of institutional performance in government, this might be a plausible account. Technological determinism tells us that the power and ubiquity of the Internet and the pace of technological change have overwhelmed human capacities to plan, design, or consider alternatives. In such a view, technology itself leads inexorably to new institutions that were planned and anticipated by no individual. These theories provide partial insights. This book is for those who believe that institutions matter.

If organizations, institutions, and technologies carry different and conflicting features, and if the emergence of interagency networks forces a confrontation among these different elements, what, exactly, can be said about the details of this new politics? Under what conditions are costs and disappointments likely to be high? What steps can actors take to improve governance? If we are to exercise control over our future we must understand our core institutions, their constituent elements, and the mechanisms by which they change with far greater clarity than we now do. If we are to control information technology rather than relinquishing control to fate, evolution, competition, determinism, cyberutopianism, a technocratic elite, or "the Internet," it will be more important to understand the interplay of technology and institution through human action than to develop dramatic predictions of a future over which we are powerless.

CHAPTER TWO

Leveraging Cyberspace to Reinvent Government

THIS CHAPTER PLACES the institutional development and the information technologies that are the subject of our inquiry in their concrete setting. In 1993 the Clinton administration under the directorship of Vice President Al Gore undertook a major government reform effort. First called the National Performance Review (NPR), in 1998 the initiative was renamed the National Partnership for Reinventing Government. The mission and objectives of this reform effort are, of course, important, but for our purposes the rhetoric, symbols, stories, and subculture of the reform are equally significant. A raft of criticism has been directed at the NPR, some of it justified. In spite of its flaws, the focus of reformers on leveraging cyberspace, using the Internet to create a new infrastructure and "logic" for organizing in the federal bureaucracy, has rapidly moved the American state toward the digital age.

In addition to laying out the central features of government reform under the NPR, in this chapter I dissect the logics of objective information technology that affect organizations and institutions and survey a variety of technology-based innovations in government to illustrate how bureaucratic policymakers have enacted technology during the 1990s. Although technology use has led to the alteration of some structures, most agency enactment of information technology has been what I call "plug-and-play."

That is, whenever possible, decisionmakers have used information technology in ways, however innovative, that leave deeper structures and processes—such as authority relations, political relations, and oversight processes—undisturbed. Organizations tend to patch information systems onto existing structures in ways that may enhance efficiency and capacity but that otherwise maintain the status quo.

A Partnership for Reinventing Government

The National Performance Review was launched on March 3, 1993, to "create a government that works better and costs less."[1] The momentum of the reform effort was created, in part, by the worldwide phenomenon of the New Public Management, a loose collection of policy and management initiatives designed to increase efficiency, accountability, and performance in bureaucratic states largely through greater use of markets and market-based management systems.[2] The NPR explicitly sought grassroots activists within the federal government who would use their detailed familiarity with government to identify and suggest hundreds of process improvements to streamline the federal bureaucracy. The NPR differed from most earlier American government reform efforts in resisting the temptation to restructure agencies. It emphasized redesigning process flows, increasing customer service to citizens, and leveraging the potential of information technology (IT) to enhance the capacity of government. The NPR headquarters staff, located in the White House, invited civil servants from agencies throughout the government to form reinvention teams. Two hundred and fifty civil servants scrutinized agency procedures and governmentwide systems in a search for improvements. Within five months NPR published its first report, *The Gore Report on Reinventing Government*. According to one history of the NPR by a staff member:

> The Vice President presented the report to President Clinton on September 7, 1993. The President and Vice President made a tour of the country to promote the report. The President issued directives to implement a number of the recommendations, including cutting the work force by 252,000 positions, cutting internal regulations in half, and requiring agencies to set customer service standards. In addition, the Congress adopted a law developed during the study phase of our task force—the Government Performance and Results Act—that required agencies to develop strategic and performance plans,

along with measures of performance, and publicly report progress annually. . . . In general, we focused on how the government works, not on what it should be doing. We chose to target the overhead costs, not the organizational structure, of agencies.[3]

The Senior Executive Service, the highest ranking civil servants in the government, intentionally were not given leadership roles in the reinvention process. Indeed, they were perceived as part of the problem rather than part of the solution. The Government Performance and Results Act mandated that agencies develop measures of success and work toward those measures in demonstrable ways. An intensive effort to cut red tape by streamlining performance programs, standard operating procedures, and business processes was undertaken. Under executive order, agencies were required to identify their "customers," develop customer service strategies, design standards for serving clients, and work out monitoring efforts to measure compliance with those standards.[4] Performance-based management became the norm in the federal government during the NPR, a move away from a bureaucratic focus on process and procedure to one on outputs, outcomes, and results. Similarly, regulatory reform shifted attention from identification of procedural violations to building partnerships with industry to jointly solve regulatory problems.

The use of information technology to revitalize, improve, reform, and modernize government lay at the center of the NPR. In September 1993, NPR staff produced "Reengineering through Information Technology," a report that included thirteen recommendations for using IT to reform government (see table 2-1).[5] Recommendations ranged from addressing a vacuum in technology leadership in the federal bureaucracy to the more mundane need to establish electronic mail throughout the government, the lack of which was a source of embarrassment and a reflection of agency autonomy and isolation. Several national and governmentwide information systems fell under the sponsorship of the NPR. Those information systems targeted by the NPR included the International Trade Data System (the subject of Chapters 7 and 8 of this book), a national law enforcement network, intergovernmental electronic tax filing capability, and a national environmental database index. Many of these initiatives began well before the NPR yet found renewed impetus following the explosion of the Internet and with visible White House support.

By the time the National Performance Review changed its name to the more active National Partnership for Reinventing Government, it claimed

TABLE 2-1. Reengineering through Information Technology (an NPR Document)

Category	Recommendations
Leadership	Strengthen leadership in information technology (IT).
Electronic government	Implement nationwide, integrated electronic benefits transfer.
	Develop integrated electronic access to government information and services.
	Establish a national law enforcement/public safety network.
	Provide intergovernmental tax filing, reporting, and payments processing.
	Establish an international trade data system.
	Create a national environmental data index.
	Plan, demonstrate, and provide governmentwide electronic mail.
Support mechanisms for electronic government	Improve government's information infrastructure.
	Ensure privacy and safety.
	Improve methods of IT acquisition.
	Provide incentives for innovation.
	Provide training and technical assistance in IT to federal employees.

Source: Office of the Vice President, "Reengineering through Information Technology," NPR Accompanying Report, September 1993 (www.npr.gov/library/reports/it.html [March 13, 2001]).

to have reduced the size of the federal work force by 351,000 and to have saved $137 billion in government spending. A later phase of reform concentrated on building interagency initiatives, virtual agencies, and the government version of electronic commerce, electronic or e-government.

The Internet as an Enabler of Virtuality

From the 1960s to the mid-1980s the technology of computing was radically transformed from one that used free-standing devices for calculation to a communication system unrivaled in extent and memory in human history.[6] During the 1960s the idea of using computers for communication was unusual. Although modems had been invented in the 1950s, connecting computers for information transfer through the telephone system was difficult and fraught with error. The Internet was first developed in the late 1960s as a small experiment funded by the Defense Advanced Research Projects Agency (DARPA) to allow scientists to run programs on remote computers. Early in the 1990s, with the development of the first

web browser, Mosaic, the Internet rapidly took form as a global system connecting millions of computers.[7] For users of the Internet it has become commonplace to communicate instantly and globally.

The Internet and a growing array of information and communications technologies fundamentally modify possibilities for organizing communication, work, business, and government. These technologies influence society and economy in ways reminiscent of the printing press, and, more recently, the steam engine, railroad, and electricity. As a revolutionary technology, the Internet—by which I mean the Internet and a host of related information technologies—provides the technological potential to influence the structure of the state as well as the relationship between state and citizen.

During the 1990s alone, process redesign efforts and innovations provided evidence that IT in conjunction with government reform efforts is likely to result, over the long run, in substantial modification of the form and capacity of the administrative state. Technology has been used to help change agency structures and has led, in some cases, to vertical and horizontal compression: a reduction in the layers of command and functional division of labor in bureaucracies. Information technology in conjunction with the redesign of organizational process flows has diminished the amount of red tape and accelerated the delivery of government services for some members of the public. Government information and an increasing number of services are available via the Internet and the World Wide Web to those with access.

Commenting on the policy implications of the Internet, Thomas Kalil, former senior director of the National Economic Council, observed:

> People with shared interests are using the Internet to solve problems, accomplish tasks, and create resources that would be well beyond the reach of any one person or organization. The Internet is being used to created virtual libraries, . . . organize massive volunteer efforts, and filter information in collaborative fashion. The ability to leverage the efforts of large numbers of networked users has important economic, social, and political consequences. This phenomenon is important to policy makers because it can potentially be used to leverage scarce taxpayers dollars and promote applications of the information infrastructure.[8]

According to Kalil, the political potential of the Internet derives from its function as a "distributed, massively parallel supercomputer that is connecting not only microprocessors but people, information repositories, sensors, intelligent agents, and mobile code." Steven Whitehead has used the term "cyberspace leveraging" to mean the use of "computer networks to harness the power of a large population of networked users," that is, to leverage the "small efforts of the many" rather than the "big efforts of the few."[9] As part of the democratic process, ease of access is central to influence, but to date the use of the Internet for political participation remains biased in favor of the educationally and economically advantaged.

As a medium that currently supports extremely low cost communication among millions, the Internet, and the access it provides to the web, differs markedly from other communications media. Its ability to enable many-to-many communication, or communication within and among groups of individuals, separates it from one-to-many (broadcast) media, including newspapers and magazines, television, and radio. Moreover, digital information is remarkably malleable, meaning it can be easily retrieved, stored, indexed, transmitted, and revised. In their current pioneering state, the Internet and the web together possess a cost structure radically different from that of any other mass media technologies. Their potential is available to nearly any interest group with access to the Web. It is not clear how the cost structure will change as the Internet is combined with other media and as its commercial potential is further exploited.

The Internet and World Wide Web enable government agencies to restructure their interactions with citizens. Some agencies—or interagency groups—have developed client-based systems to provide government information and services. Others have developed electronic commerce by constructing web-based bidding arenas for government contracts. The government has also developed information-based networks. In January 1999 the Internal Revenue Service (IRS) accepted its first credit card payment over the Internet. Previously the IRS allowed taxpayers to file returns online. But since 30 percent of those who filed their taxes online owed money, they still had to mail in a check or money order. Before accepting credit card payments, the IRS had to determine how to reconcile tax returns with payments and how to credit taxpayer accounts accurately. Once it did that, in 1999, 20,000 citizens used credit cards to pay their taxes.[10]

When the first national atlas of the United States was produced in 1970 it weighed twelve pounds, and the production run was limited to 15,000 copies. In 1997 the United States Geological Service (USGS) coordinated the production of the second national atlas on the web. Internet users may

now create their own maps at www-atlas.usgs.gov using data from the USGS, the Census Bureau, the Environmental Protection Agency, and other agencies. Jay Donnelly, the atlas's managing editor, observed, "With the World Wide Web as the publishing medium we no longer have to restrict content. We can make the digital representations of maps available to the public regardless of theme."[11]

Users who design their own maps may combine demographic, environmental, geographic, geologic, and other types of data from various agencies:

> Users can create a map that displays the nation's streams and watersheds overlaid with data on toxic releases or Superfund sites. USGS has produced hard-copy maps for the project, but the days of the 12-pounder are gone. These are separate maps on specific subjects such as the nation's principal aquifers/groundwater resources, watershed boundaries and the distribution of federal and American Indian–owned land. Most recently the USGS released a shaded relief map of North America. It will issue a map on the nation's wetlands next. All printed maps have Web-based counterparts.[12]

Similarly, the Environmental Protection Agency (EPA) provides environmental and regulator data to the public over the web. EnviroMapper (www.epa.gov/enviro/html/em/index.html) includes data on water quality, toxic releases, hazardous waste, and Superfund sites. In order to monitor the environment, the EPA spends $400 million annually to collect data. The EPA realized that by posting its vast repository of geographic information systems and regulatory data on the web, all users, including environmental activists, corporations, and concerned citizens, would have the ability to create customized maps without staff assistance from EPA. Thus the disintermediation of public information possible through the web at the same time reduces agency workload and costs. By placing its data on the web, the agency estimates it will save $5 million annually.

The term "virtual," as I use it in reference to the state, refers to capacity that appears seamless but that exists through the rapid transfer and sharing of the capacity of several discrete units and agencies as their partners. For example, by rapidly transferring memory across several disks to optimize free disk space, a computer may have a virtual memory that is much larger than its actual memory. A virtual circuit may function as an actual circuit when in fact it is a packet-switched network.[13] Similarly, clients interact with a virtual government agency as if they are interacting with a coherent physical organization when in fact they are interacting with several agencies that may be integrated only through digital networks. As the state becomes increasingly networked through information systems, interagency arrangements, public-private partnerships, intergovernmental agreements that join federal, state, local, nonprofit, and private actors, and web-based services that link the websites of hundreds of organizations, we may speak of a virtual state. Virtuality is a function of the apparently seamless integration of disparate, jurisdictionally separate, often geographically dispersed parts.

The Internet and the web, although by no means the only information technologies to influence bureaucratic reform, have enabled disjunctive changes. Although interorganizational arrangements and the embeddedness of economic activity in social networks were topics of practical and scholarly interest well before the widespread use of the Internet and the web, the effect of these technologies on the rate and scale of network formation has been extraordinary yet poorly understood.[14]

A transformation of communication as fundamental as that brought by the Internet and the web should not be underestimated. Lucian Pye, one of the central scholars of communication and politics writing pre-Internet, observed: "Communications is the web of human society. The structure of a communication system with its more or less well-defined channels is, in a sense, the skeleton of the social body which envelops it. The content of communications is of course the very substance of human intercourse. The flow of communications determines the direction and the pace of dynamic social development."[15]

Functional differentiation and the clear division of labor as means of organizing information and information processing in complex organizations are giving way to the structuring of information using computer-based information systems. By removing the artificial boundaries between subunits and people, more of the burden for organizational structure can be assumed by information systems. Hierarchy diminishes in importance as a means of control as teams have come to manage more work and make decisions. As a consequence, roles and job descriptions have become more fluid in order to accommodate cross-functional and network configurations. Entire units and jobs in bureaucracy were once devoted to the management of paper files. Not only clerical work, but also report writing and an array of middle-management tasks were devoted to accumulating and sorting information. Although it is now clear that many mid-level managers perform critical tasks that cannot be automated, much of the routinized information processing that was performed in the middle strata

of complex organizations is now handled by computers. In addition, the digital file allows information to be made available "anywhere, anytime" around the globe if the information system is so designed.

Virtual Agencies

Agencies have a growing ability to integrate information, decisionmaking processes, and flows across organizational boundaries. As integration efforts continue, notions of jurisdiction are likely to change. Integrated information processing not only greatly speeds the flow of information and services across organizations but also modifies some rationales for jurisdiction by significantly lowering transaction costs. Internal contracting within the federal bureaucracy, public-private partnerships, and networks among federal, state, and local agencies, nonprofits, and firms are proliferating. These network arrangements are more complex than simple outsourcing contracts. The ability to organize, coordinate, and control complex policy domains is changing and will continue to modify the structure of government, the relationship between competition and collaboration among government actors, and government-business relationships.

The federal government has adopted the idea that clients of government (individuals and firms) should have a single point of entry for government information and services. This movement extends the notion of "one-stop shopping" and makes the information providers responsible for minimizing search costs.[16]

Shared databases within agencies made it possible for personnel responsible for providing public services to offer a wide range of information as well as to retrieve and modify citizens' documents, often in real time. The customer contact units of the Social Security Administration, the IRS, and the Immigration and Naturalization Service, among others, rely on shared databases to provide current services to the public. Shared databases across agencies, without regard to jurisdiction, allowed an even wider range of information and services to be integrated at the point of contact between the public and the state. More recently, the Internet has increased the possibilities and pressure to integrate across an even wider variety of traditional boundaries in order to reduce search costs for the public and to solve policy problems that cannot be adequately addressed without such integration. Integration of information in websites and databases may not—and in most cases does not—imply any actual integration of programs or services. Thus agencies can achieve virtual integration—

producing virtual agencies—often without changing their structure, jurisdiction, or budgetary autonomy.

Networks of government actors have always been an important feature of the federal government. It is the growth in their use that is startling. That growth invites the reformulation of concepts such as jurisdiction, accountability, and command-and-control hierarchies. Among the questions raised by the growth of interagency networks are: What are the long-term effects of socializing individual and corporate actors to view, for example, "trade administration" or "services for senior citizens" as a single entity rather than as a number of agencies, cultures, and jurisdictions? Is there a dynamic force within the virtual integration of programs that may lead to other forms of agency integration? When should actual, rather than virtual, restructuring occur? What are the criteria that should guide decisions about degrees and types of integration?

One of the precursors of structural change in the nation-state appears to be data standardization across agencies. Shared databases are not possible without standardized data, and, once developed, they create a platform for further integration efforts. Thus data standardization, catalyzed by the Internet, represents a significant rationalization of agency and interagency processes. First, standardization renders redundancies across agencies transparent. Second, standardization weakens the rationale for having different agencies collect and store highly similar or identical data elements. Third, data standardization suggests new forms of analysis that may lead to changes in the structure and organization of agencies. Fourth, structural changes in the federal bureaucracy are inevitable as redundant data collection, storage, and analysis by different agencies is eliminated. The political battles revolve around which agencies will win and which will lose ownership of data.

The Information Network for Public Health Officials (INPHO) is housed at the Centers for Disease Control and Protection of the U.S. Public Health Service. It "is an initiative to build an information infrastructure serving community, state and federal public health practitioners" and gives "public health agencies new access to formerly centralized information" in an effort to unite the public health and medical care communities.[17]

Virtual integration in international networks has also proliferated, often with coordination by the U.S. government. For example, in 1996 the Office of Arms Control and Nonproliferation in the Export Control Division of the Department of Energy (DOE) developed and put at the service of the international nonproliferation community an automated system to

coordinate efforts against the spread of nuclear weapons. According to program documents:

> The Nuclear Suppliers Group Information Sharing System (NISS), is a high-speed, highly-reliable, low-cost system whose transmissions are secure against eavesdroppers. . . . Each NISS user feeds information into NISS on its own local computer terminal and has synchronous access to the entire NISS computerized database through geographically-distributed architecture. The information from NSG members flows to a central location at DOE's Los Alamos National Laboratory, where the data is updated automatically every 24 hours. . . . The system enables the 32 member countries of the Nuclear Suppliers Group (NSG) to keep informed on what each member is doing to deny proliferation-sensitive materials, equipment, and technology to would-be proliferant countries. Awareness of an NSG member's denial action puts the other NSG members on guard against proliferant efforts to find an alternative supplier and eliminates the possibility of suppliers economically undercutting each other. DOE notifies member states of denials as well as other information on nuclear-related exports simultaneously.[18]

Not surprisingly, the concept of a virtual agency captured the imagination of the NPR staff. The central idea was to create networked constellations of individuals, programs, services, information, and agencies on the web to "virtually" reorganize agency information and services in ways that would better serve all constituents.

At a 1996 conference on virtual agencies sponsored by the Defense Technical Information Center (DTIC) for the federal government, the topics addressed included: creation of a one-stop guide to federal statistical information using a robot program to collect key HTML pages and documents from over 4,000 URLs and to create a comprehensive set of indexes; FedWorld's proposal to support all of an agency's online needs; and virtual social work, which envisioned "a converging, synergistic world of the digital economy, electronic commerce, digital democracy, electronic government, virtual communities of place and interest, virtual agencies and organizations."[19]

Through virtual diplomacy the communication and coordination attributes of the web allow potential changes in policymaking structure and practice even across sovereign state boundaries. The role of the State Department as an intermediary between U.S. agencies and their international

counterparts is changed as a result. Similarly, direct international communications and coordinating alter the role of international organizations.

Federal interagency websites, or virtual agencies, would enable service integration not possible outside cyberspace. The number of federal interagency websites indicates the magnitude of this effort (see box). By November 2000 the number of interagency websites had grown to twenty-six, covering nearly all policy domains. For example, Access America for Seniors, a government web portal for seniors, compiles information and services from nineteen agencies. Afterschool.gov is a virtual agency that connects citizens to the resources of fifteen federal agencies "that support children and youth during out-of-school time." The U.S. Business Advisor, the first of the NPR-sponsored virtual agencies, co-locates all information and services from the government used by small-business owners.

Vision versus Reality

The visionary initiatives highlighted here contrast with other more challenging technology issues struggled with by the NPR. In October 1993 President Clinton signed Executive Order 13011, which established the Government Information and Technology Services (GITS) Working Group

Federal Interagency Websites

Access America for Exporters
Access America for Seniors
Access America for Students
Afterschool
BudgetNet
CodeTalk (Native American)
Commonly Requested Federal Services
Consumer Protection
disAbility
Federal Business Opportunities
Federal Consumer Information Center
Federal Information Center
Federal Resources for Education Excellence (FREE)
FedStats (statistics)
Financenet
Healthfinder
Inspector General Network
PAVNET (Partnership Against Violence Network)
Recreational Opportunities
Web Pages For Kids
U.S. Business Advisor
U.S. NonProfit Gateway
U.S. State and Local Government Gateway
Veterans
Youth Info
Workers[20]

to implement the recommendations of the initial NPR report in part by promoting the development of innovative technologies and government practices, seeking the views of government and outside experts, and recommending opportunities for cross-agency cooperation and the sharing of infrastructure services.[21]

A status report on the original IT initiatives of the NPR also noted that the federal government was lagging behind the private sector for several reasons—regulatory, legislative, and cultural—and that it lacked access to current technologies and services.[22] The NPR staff felt that the government lacked a coherent overall plan for using the potential of technology in government and that it lacked leadership in this area. They wanted to provide a government counterpart to Clinton's commitment to make technology the "engine of economic growth" in the economy. But most of the rhetoric focused on government-to-citizen, or first-wave, use of the Internet, such as online student loan applications and approvals, electronic fingerprinting of criminals to create a national crime database, and one-time entry of information for seniors to cover Medicare and pension programs throughout the government.

The rhetoric of the NPR reflected the hyperbole and lack of analysis that dominates popular management writing on cyberissues. Political rhetoric understandably serves purposes other than neutral analysis.[23] But political rhetoric cannot substitute for reasoned, empirically based analysis and analytical frameworks required to guide government officials undertaking major structural reform while absorbing significant personnel cuts and near static appropriations to agencies. Internal government documents—notably from the General Accounting Office, the Office of Management and Budget, and the federal information resources management community—tend to ignore institutional change, focusing instead on information resource management issues such as the life cycles of computer systems, their cost and capacity, and proper methods of systems planning and procurement. What has been missing is sustained examination of the implications of networked information and organizations for policymaking, the capacity of the state, and governance.

CHAPTER THREE

Networked Computing

IN CHAPTER 2 we examined virtual agencies in the context of the National Partnership for Reinventing Government. This chapter completes our examination of the attributes of networked computing and its uses in American government. The level of hyperbole and mythology regarding information technologies calls for a careful appraisal of attributes and technology enactment before proceeding further in our inquiry. Information technology differs from other technologies in its capacity to manipulate symbols used in all types of work. It

Examples of IT innovation in this chapter from the Ford Foundation–Harvard University Innovations in American Government Awards Program were selected as part of a systematic analysis of IT-based innovation in government. I am grateful to Alan Altshuler, director of the Innovations in American Government Program at the John F. Kennedy School of Government, for access to all finalist and semifinalist applications to the awards program. I examined more than fifty detailed applications, submitted from 1993 to 1999, that advanced to the finalist and semifinalist ranks of an annual competition of innovations in government held at Harvard University. The study found that most technology innovations, although highly useful and creative, did not involve structural changes in an agency or program. Typically, these innovations were better characterized as "plug and play"; that is, they could be tacked on to existing structures with little modification.

has the potential to affect coordination as well as production and decisionmaking processes within and across institutions and organizations. In theory, particularly in theories of machinelike bureaucracy, information technology should make feasible a wide range of efficiencies through its effects on coordination and information. One of the chief potential effects of advances in information technology on bureaucratic organization has been the ability to structure information processing and flows using networked computing rather than through the strict delineation of roles, organizational relationships, and operating procedures. In practice, however, gains in efficiency and effectiveness depend critically on organizational structure and design rather than on technological infrastructure.

To the extent that information is power, the ability to design communication and information flows unavailable in the Weberian bureaucracy and to locate information anywhere that individuals have access to networked computers signals the potential for significant shifts in power. Current communication and search costs for web-based information located anywhere on the globe are virtually zero. The implications of this political economy of information for the structure and capacity of the state are enormous.

Information technology makes some structural features and operations relatively inexpensive and easy to implement. Think, for example, of the ease of website creation and making government information accessible to anyone with a computer, a connection, and an Internet service provider. Networked computing can make other decisions more difficult, however. For example, once an agency has established an active Internet presence, it may be more difficult to justify providing face-to-face service, even though many citizens still lack Internet access. Thus technology, by changing the costs and benefits of design choices, influences design, structure, and politics. Moreover, large technical systems, such as the legacy information systems and software used in the federal government, carry sunk costs—in the form of the dollars spent on putting the expertise, contracts, and physical infrastructure in place to begin with. Thus decisions made during the initial phases of system design strongly constrain subsequent choices. Because of such "path dependence," then, choices regarding some technologies may be said to be determinist. In sum, technologies themselves influence choice, but the relationship is indirect, sometimes subtle, and exercised in combination with other economic, cultural, political, and social influences.[1]

Information technology is enacted by governments to support dominant societal values. In the United States prevailing uses of IT support economic competitiveness and efficiency and provide some attention to democratic values of equality and liberty. In contrast, the central government of the People's Republic of China (PRC) enacts networked computing as an instrument of social control and surveillance. Technologies used for jamming, blocking, and filtering information dominate. In the royal Islamic government of Saudi Arabia, the state exercises more selective societal control, using some of the most sophisticated filtering technologies in the world. Similar information technologies may be used in dramatically different ways, as these examples demonstrate. However, the current open-source standards and protocols of the Internet and World Wide Web mean that authoritarian states must employ strong measures to maintain societal control in a networked world.

Effects on Distance, Time, and Memory

Information technologies affect information flows, coordination, and the work of the bureaucracy by altering the relationship between information and the physical factors of distance, time, and memory. When information is digitized and shared, geographic distance becomes less relevant—and in most cases irrelevant—to information flow, making possible geographically distributed partnerships, collaborative problem-solving, and highly coherent organization.[2] Time also may be said to become more fluid as a bureaucracy uses asynchronous communication. Store-and-forward systems and shared databases have reduced time delays in production and decisionmaking that were the consequence of multistep, linear information flows. The Social Security Administration can shift incoming calls from one time zone to another in order to expand its telephone-based service to the public beyond the typical federal workday. Thus, for example, calls dialed at 5:10 P.M. eastern standard time may be forwarded west to a center still in the middle of its business day.

Organizational memory (storage, organization, and retrieval), which exists in part in the form of shared databases, collects data from and provides it to all authorized points in agencies. This digital memory also maintains information in easily retrievable and malleable form over time. As part of a shared database, that part of organizational memory that was traditionally stored on paper in files and managed by clerical staff can be accessed systematically, analyzed for patterns, and used to benefit administration and future decisionmaking. But unlike paper files, digital

information may be structured to reveal patterns and exceptions, thus creating much more than the simple memory that is stored in a file cabinet. These three properties of information flow and coordination—time, distance, and memory—allow agencies to more easily establish and build intra- and interorganizational networks among members who share production processes but are located in geographically separate settings.

Telecommunications networks allow decisionmakers to place nearly any digitized information anywhere to be available any time and in nearly any format. With this telecommunications infrastructure comes the ability to virtually network employees and work both within agencies and, increasingly, across agencies and entities. Information (the "files") located in shared databases or intranets, and now more frequently available on the web, can appear in any location and at any time a computer is available. Thus government information and services can be available at kiosks in malls, through personal computers in homes, at town libraries, in small rural settings and large urban centers, from Washington headquarters, and at remote field locations in the wilderness, desert, or U.S. territories.[3] For example, the General Services Administration designed "Government Services Express," service centers located where citizens tend to carry out their daily errands: in shopping malls. Service centers opened in 1999 near San Francisco at the Milpitas Great Mall and north of Boston at the Liberty Tree Mall in Danvers, Massachusetts. Constructed and administered in partnership with state and federal agencies, the kiosks allow anyone to read and print a variety of government information and forms as well as to carry out some transactions, including filing federal income tax forms. Video teleconferencing is available at centers for citizens who require advice that is not available in text form.[4]

In 1993 the U.S. Department of Education began to build a network of teachers to improve policymaking. Its "Goals 2000 Teacher Forum" invites teachers to voice their policy ideas in person and, beginning in 1995, via satellite teleconferencing. The department also maintains a computer network of outstanding teachers who provide feedback and input to policymakers. Forum participants and other award-winning teachers are included in a database of experts in education as potential mentors for other teachers. The department in this case serves as a central node for the network as well as a facilitator of dialogue. The rich, ongoing social connections enabled by the Internet and network approaches to policymaking blur the boundary between teachers and federal officials in the policymaking process.[5]

Simultaneous Centralization and Decentralization

Coordination and control have been central to theory and research on organizations, management, public policy, and administration. Traditionally, the tension between organizational centralization and decentralization was caused by the complex tradeoffs involved in determining the best location of the decisionmaking authority. Local field offices make policy and operational decisions based on region-specific information and experience. In contrast, federal headquarters, where agencywide policy is made, must maintain equitable operations across regions. But excessive central control impedes local responsiveness and adaptation and imposes reporting requirements that can be onerous. When headquarters must have all the relevant information in hand before local decisions can be made, delays are inevitable.

But data collected at remote field locations, once digitized, can be as easily available at headquarters as in its field locations and may be easily transferred without going through several layers of hierarchy. The creation of telecommunications networks can greatly reduce the space (files), staff, and tasks needed to manage data. Similarly, information generated at headquarters can be easily transferred to and enhance the activities of field locations. Telecommunications networks, increasingly linked to the Internet and web, allow bureaucracies to centralize some tasks and decentralize others. The design challenge is to structure field units to maximize the benefits of local knowledge while using centralized systems to maintain control and prevent redundancy. The results of local activity in digital form are transferable to central databases almost immediately. Simultaneous centralization and decentralization are possible, but as a practical matter agency officials have the ability to make structural adjustments without all of the constraints imposed by the traditional tradeoff between centralization and decentralization.

During one month in 1989, Hurricane Hugo devastated the southeastern United States and the Loma Prieta earthquake damaged parts of northern California. These disasters triggered relief efforts of the Federal Emergency Management Agency (FEMA) for 450,000 people that were the equivalent of those needed in three typical years. The enormity of these crises led the agency in 1995 to begin developing, as part of a larger modernization program, an integrated computer system for disaster relief. One new feature of the system is Automated Construction Estimating (ACE), which streamlines the delivery of aid to disaster victims: to save

time, FEMA field inspectors transmit the results of home damage inspections (which serve as the basis for disaster awards) via handheld computers directly to the Disaster Field Office for data entry and transmission to headquarters. Similarly, disaster victims' information is transmitted electronically to the central processing facility at headquarters, resulting in greater data accuracy and more completed inspections each day.[6]

The ability to enter data into a digital system only once, combined with the capability to rapidly transfer data from field units to headquarters and to use software to calculate the amount of damage compensation, has resulted in significant capacity gains. Greater operating capacity at the field level and more rapid response were achieved in combination with—rather than at the expense of—greater center control.

Data can be available at headquarters and field locations in forms useful to decisionmakers at several levels. Critical management tasks include deciding which data are needed at which organizational locations, how current those data should be, and in what formats they would be most useful to the decisionmakers who will use them. Multiple sources and easy availability of centralized data collected from branch offices help avoid the problems created by outdated information and information that has been filtered through several hierarchical layers. Information systems allow for objective data reduction and near real-time transmission. When field personnel lack the information to make effective operational decisions because it is located only at headquarters, then agencies may benefit from the decentralization of those data. Many managers perform suboptimally because they are not fully aware of agency goals, lack the informational resources to make informed decisions, or lack motivation because incentives do not align with objectives.[7] When performance incentives are linked to control systems through shared information, the effect on performance is powerful and meaningful.

Redesigning Production Processes

Classical management theories assume a positive correlation between task complexity and a person's position in the hierarchy. In the quest for efficiency, functional specialization in many jobs has been carried to an extreme in order to simplify, and often to deskill, tasks.[8] In the federal bureaucracy, systems of job classification and seniority initiated during the late nineteenth century and increasingly elaborated until the 1980s fueled excessive functional specialization. Diseconomies produced by the

coordination required to join increasingly numerous small and specialized jobs soon overshadowed the efficiencies of functional specialization.[9] As complexity increases so does specialization, with consequent increases in interdependence and coordination.[10] Traditionally, coordination has been achieved in large measure through direct supervision. Between 1993 and 1996, when 350,000 jobs were eliminated in the federal bureaucracy, supervisory positions were eliminated at twice the rate of nonsupervisory managerial positions. Approximately one-third of the work-force reductions targeted first-line supervisors, those at the lowest supervisory rungs.[11] Although in many cases this severe downsizing preceded the coordination gains that were expected from the use of information systems, it is not surprising that the supervisory ranks were attenuated. Theorists as early as the 1950s predicted the demise of middle management as a direct result of computer use in complex organizations.[12]

A first-line supervisor at an automated government facility of the Immigration and Naturalization Service reported to me that he spent a whole afternoon once a week hand-tallying numerical information supplied by his staff of approximately twenty-five immigration information operators, including the types and number of phone calls handled by the operators during the week. This occurred in a facility considered "state of the art," in which each operator and the supervisor already used desktop personal computers and advanced call-center technologies. That task alone accounted for 10 percent of the supervisor's time annually.[13]

Computerization has made it possible to combine many excessively specialized positions into "enlarged" jobs for individuals or teams. For example, during the late 1980s the Social Security Administration, which serves nearly 50 million citizens by disbursing welfare, disability, and survivors' and retirement benefits, customarily transferred requests for claims from administration telephone operators who received them from a separate claims processing unit. Citizens typically waited several weeks for a return call from a clerk in the claims processing unit, who would then collect information to initiate a process. By retraining operators and reprogramming computers at the telephone centers, the agency combined the initial steps of the claims process with the existing tasks of telephone operators.[14] Such compression of the horizontal and vertical flows of information and decisionmaking at SSA and across governments has significantly reduced coordination needs.

The aggregation of tasks, in which operators are given more responsibilities (including some that may have been classified at a higher pay grade)

using computer-based information processing and "decision support tools," is often described as "empowerment" or "job enlargement." "Decision support systems," including access to databases and modeling software, give clerks low in the hierarchy the ability to make more decisions because the rules (or standards) they are to follow are embedded in software rather than in the decisionmaker. But the range of potential choices the "empowered" operator can make is often limited by the software, thus embedding control formerly exercised by supervisors. Moreover, an operator's decisions are visible to those in charge, and the system may automatically report deviations from standard procedures. (An important debate about the nature and motivation behind the "empowerment" of operators is discussed in Chapter 10.)[15] It should be obvious that any new discretionary authority granted to government employees is balanced, perhaps overshadowed, by the immense ability of IT to monitor, capture, and display employee activities.

Rationalization and the automation of information flows have been central features of restructuring efforts in the federal bureaucracy. Clerical tasks, the work that permeates government, are heavily affected by information technology. These tasks, often classified as "information work," include accounts processing, claims processing, social security administration, tax administration, welfare disbursements, student loan processing, and a large number of other linear, multistep processes.

The Postal Rate Commission, for example, must conduct hearings on all rule-making cases such as proposals for rate increases and post office closings. Rule-making is conducted as a legal proceeding and includes the phases of discovery, cross-examination, hearings, the submission of briefs, and finally a recommendation to the Postal Board of Governors. A proposed rate increase, for example, typically entails ten months of proceedings. Citizen and business response, or pleadings, during hearings may amount to 35,000 pages of documents, which must then be reproduced as many as 150 times, resulting in 5.2 million printed pages.

To handle this volume, the commission has developed a document management system, called Operating Online, which scans information into digital form. All digital files are publicly available on the Postal Rate Commission website at www.prc.gov. Although the $370,000 system will save only $150,000 a year in costs, the availability online of all documentation related to hearings reduces the costs of rule-making.[16] Most agencies with regulatory mandates have developed similar document management systems.

During the rule-making process, the information agencies must manage comes in the form of public comment, petitions, extensions, and adjudications. A docket, the voluminous file containing all information related to a proposed rule, must be managed by clerical staff. In 1993 the Department of Transportation—whose rule-making authority ranges from the regulation of air bags to the transport of hazardous materials—managed nine "docket rooms" and relevant staff. If materials were lost, there was no ability to track them, and researching a docket was an arduous task. Then the docket management process was moved to the web and opened to the public at the Docket Management System (DMS) website, www.dms.dot.gov. Now, the system lists the most requested dockets. In the fall of 1999, when one of the most requested dockets was a Maritime Administration attempt to reregister eight ships, designed to carry liquefied natural gas, under a foreign flag, the site received more than 12,000 requests for information (or hits) from the petitioning firms and from crew members of the ships that would be affected by the reregistration.[17]

Decision support systems also modify the design of decisionmaking processes, or "knowledge work." The knowledge worker adds value to information by virtue of training, education, and experience. Among the knowledge workers in government are specialists who develop loans and other financial instruments, provide counseling, write contracts and regulations, and design legislation, as well as budget analysts, logisticians, and lawyers. All are potential users of decision support tools. The following examples illustrate the complexity of analysis conducted in the federal bureaucracy, which when conducted well is largely invisible to the polity.

From 1978 to 1997, ten airline accidents were attributed to ice formation on aircraft. In response to these tragedies, the Federal Aviation Agency strengthened the rules for de-icing aircraft before takeoff and implemented a decision support system to help in the decisionmaking process. The process for deciding when to de-ice is dynamic and complex. Three different de-icing fluids may be used, each with different costs and chemical properties. The Environmental Protection Agency requires de-icing fluid to be recovered following its use. Climatic variations, including humidity and temperature, as well as flight delays all must be considered. The new decision support system, named Weather Support to De-Icing Decision-Making (WSDDM), uses data from Doppler radar, surface weather instruments, and snow gauges to help air traffic controllers and pilots reach the most efficient de-icing decisions.[18]

Similarly, the development of the $540 million Advanced Weather Interactive Processing System (AWIPS) by the National Weather Service allows forecasters to monitor and detect precursors of severe weather and issue earlier warnings. Supercomputers used for atmospheric modeling combined with an information system that integrates several data sets allow extremely rapid data analysis. In May 1999, seventy tornadoes in Kansas and Oklahoma resulted in fifty fatalities and more than $1 billion in property damage. Weather experts report that the number of casualties would have been much higher without the degree of advance warning made possible by the system.[19]

Performance Measurement as Control

Control processes allow agencies to measure performance and to gather timely, clear, and accurate feedback on the degree to which standards have been met. Decisionmakers must then interpret those results and make strategic and operating decisions based on their interpretations. Control systems traditionally serve three functions in management. First, they help decisionmakers use resources more effectively by providing feedback on the production process. Second, they provide coherence to disparate performance units and divisions to bring them into greater conformity with agency goals. Third, they supply data for strategic decisionmaking.[20] Information systems not only provide the potential for efficiency gains but also have led to the development of powerful new tools for control.

A simple but important illustration is provided by the Office of Thrift Supervision (OTS), the Treasury agency that regulates savings and loan associations. OTS implemented the Savings Institution Risk Management Program to minimize losses in savings and loan investments as a consequence of a rise in interest rates. A computer-based model permits OTS to identify institutions with the greatest risk of investment loss and also allows individual institutions to monitor their own interest rate risk and adjust their exposure to avoid losses or increase their capital cushion without costly government intervention. The model uses a stress test to predict each savings and loan institution's potential loss under different interest rate scenarios. The interest-rate risk model is an off-site monitoring tool that permits the regulator and the institution to analyze fundamental industry financial elements in a more timely way and with greater accuracy than is possible by traditional on-site examination. The Treasury analysts who developed and now manage the system report: "The implementation

of our system has greatly reduced the possibility that we will ever experience another thrift crisis that is interest rate risk related. We believe the system has fundamentally changed risk management practices in the industry for the better."[21]

A second example illustrates the importance of control systems in health care. The Indian Health Service administers hospitals and health care centers throughout the United States for American Indians and Alaska Natives. It also monitors health risks specific to those populations. The Indian Health Performance Evaluation System (IHPES) was developed in response to new hospital accreditation standards by the Joint Commission on Accreditation of Healthcare Organizations. A system designed with measures of risk specific to Native American populations was thought to be more effective than the national risk management systems developed throughout the health care industry. For example, because diabetes is epidemic among Native Americans, the system monitors hospitals and health care facilities to be sure that blood sugar is regularly checked, that eye and dental exams are given, and that nutritional education is made available. By monitoring precursors of diabetes as well as the use of diagnostic procedures and preventive care and counseling, the system is used proactively rather than simply as a retrospective measurement tool.[22]

Community Connections is an initiative pioneered by the United States Department of Housing and Urban Development (HUD) in early 1994. Before the program's implementation, HUD mandated twelve separate housing and community development programs from every state and locality. Because these programs were uncoordinated, they hindered community development, prevented citizens and communities from sharing information, and frustrated evaluators' attempts to measure agency progress. Community Connections replaced the programs' separate applications with one consolidated plan that uses performance measurements to trigger funding for over $10 billion in HUD programs. Performance data are analyzed using a computer program that replicates community features using mapping software, demographics, and HUD information. All of these maps are available on the web.[23]

Information technology cannot determine the appropriate performance measures or standards for agencies. But once those are established, software analysts can embed routines, rules, and standards in programs and procedures to make data collection easier, data collation automatic, and the generation of reports simple. Information technologies rationalize and standardize elements more powerfully than standard operating procedures

and supervisors. Embedded rules in software applications subtly but clearly identify the aspects of tasks that are discretionary. Information-based organizations thus codify knowledge and inculcate habits in a somewhat different but much more powerful manner than traditional bureaucracies. In many but not all ways, the control problem in government has never been easier to manage. During the twentieth century, the bureaucratic state moved from direct supervisory control to bureaucratic control and now, in information-based organizations, is moving to embedded control.

Enabling or Deskilling?

Information technology formalizes the knowledge and know-how of skilled workers and thereby makes it relatively independent of those actors. The routines, procedures, knowledge, expertise, and problem-solving maps used by workers at all levels can, in part, be "objectified" (or formalized) by being designed into equipment and machinery, including, of course, software, hardware, and telecommunications. This formalization is similar in many respects to the formalization of work in organizations through the development of routines, standard operating procedures, and performance programs.[24]

Through the formalization of work and decisionmaking, IT may be used either to deskill work or to complement and enhance the abilities and skills of those using it.[25] A debate that persisted throughout much of the twentieth century and continues into the present argues whether technology increases discretion, creativity, and skill in bureaucracy or alienates and deskills workers. One more recent stream of this debate has focused on the discretion of decisionmakers over the design of technology as a mechanism of coercive control and deskilling or as a tool to enable greater discretion, to leverage expertise, to promote joint problem-solving, and in general, to complement and leverage human capacity.[26] Designers do influence how information systems are used and the ways in which they shape organizational arrangements. As Paul Adler and Bryan Borys put it:

> According to one rationale, the user is a source of problems to be eliminated; according to the other, the user is a source of skill and intelligence to be supported. In one, labor is a source of error, and the goal of design is to get the operator out of the control loop; in the other, equipment is seen as inherently limited, and the goal of design is to ensure the operator can intervene effectively to rectify problems.[27]

In the army, a concept known as the "user as developer" was adopted to explicitly put users into the design phase of new information systems. Through its traditional approach to development, the army had had significant experience developing and building information systems that were both out of date and inappropriate for users by the time they were ready to be used. By adopting an evolutionary approach in which designers were asked to "build a little, test a little," the army was able to reduce costs, shorten development cycles, and produce information systems that were closer to the needs of its personnel (see Chapter 10 for more detail).

In this chapter and the last we have seen that the Internet has the potential to fundamentally affect organizational coordination, control, and communication. Bureaucratic policymakers are using information technologies to reshape service delivery, enforcement and control, relationships between headquarters and field units, and the boundary between state and society. Complex rule-making takes place increasingly on the web. Risk management programs embedded in networked computing influence decisionmaking throughout the government. Performance measurement, again embedded in decision support systems, shapes behavior and decisionmaking and provides clear data patterns for analysis and policy refinement.

The growth of virtual agencies and networks of several variants suggests that bureaucracy may be changing and that government networks are increasing. But what are the structural elements of the bureaucratic state? And what are the implications for the use of information technology and the structure of the American state? To answer these questions, and to probe more deeply the organizational and institutional arrangements that I argue shape the enactment of technology, the next two chapters analyze two predominant organizational forms, bureaucracy and the network.

CHAPTER FOUR

Bureaucracy

> The reduction of modern office management to rules is deeply embedded in its very nature.
>
> *Max Weber,* Economy and Society

SINCE THE INDUSTRIALIZATION of the United States in the late nineteenth century, government has required a complex administrative and policymaking machinery in order to manage its day-to-day operations and implement legislation. The rhetoric of "post-bureaucracy" notwithstanding, this administrative machinery, and the career public servants within it, continues to be an essential intermediary between elected officials and society. It transforms the often vague and ambiguous decisions and judgments of the executive, the legislature, and the judiciary into operational and organizational rules and programs. Its attributes and vitality are more than ever of crucial concern to government and, ultimately, to citizens. In an industrialized society and economy, the state is central to contemporary political life.[1]

This chapter develops ideas first published in "The Virtual State: Toward a Theory of Federal Bureaucracy in the Twenty-First Century," in Elaine Ciulla Kamarck and Joseph S. Nye Jr., eds., *democracy.com? Governance in a Networked World* (Hollis, N.H.: Hollis, 1999). I am grateful to the Visions of Governance in the Twenty-First Century Project at the Kennedy School of Government, Harvard University, for financial support and to the faculty associated with that project for early comments on many of the points discussed in this chapter.

It is commonplace to claim that information technology changes the structure of organizations. Attention to network organizations signals one significant move away from bureaucracy. The reduction of red tape and flattening of hierarchies in government over the past decade have signaled further change. Yet few researchers interested in technology have addressed the bureaucratic "structure," or the modern state, in much detail. Here and in the next chapter on interorganizational networks I attempt to do just that as a means of examining the dynamics of virtual agencies and the growth of digital government. The result will be a better understanding of the ways information technology is actually used and how current uses interact with agency structure and practice. This inquiry will also help formulate a response to the question: Is there a transformation of the bureaucratic state taking place that can be at least partially attributed to the information revolution? If so, what are some of the political and policy implications of these structural modifications? Of course, any discussion of bureaucratic structure must begin with Max Weber, and so our excursion into the bureaucratic form begins.

Weberian Bureaucracy

Although Weber depicted bureaucracy as an ideal type, he also argued early in the twentieth century that bureaucracy is the only form of organization able to cope with the complexity of modern enterprise.[2] In fact, wherever complex coordination of activities has taken place since ancient times, bureaucracy has of necessity sprung up.[3] During the twentieth century we became a society of organizations.[4] Weber's depiction of this organizational form proved central to twentieth-century public administration, to the Progressive agenda from approximately 1920 when the English translation of his work first appeared, and to the normative construction of the role of the bureaucrat.[5] Weber outlined the key elements of bureaucracy in the economy and the state as follows:

Characteristics of Modern Bureaucracy

Modern officialdom functions in the following manner:

I. There is the principle of *official jurisdictional areas*, which are generally ordered by rules, that is, by laws or administrative regulations. This means:

(1) The regular activities required for the purposes of the bureaucratically governed structure are assigned as official duties.

(2) The authority to give the commands required for the discharge of these duties is distributed in a stable way and is strictly delimited by rules. . . .

(3) . . . Only persons who qualify under general rules are employed.

In the sphere of the state these three elements constitute a bureaucratic *agency*, in the sphere of the private economy they constitute a bureaucratic *enterprise*. Bureaucracy, thus understood, is fully developed in political . . . communities only in the modern state, and in the private economy only in the most advanced institutions of capitalism.

II. The principles of *office hierarchy* and of channels of appeal[6] . . . stipulate a clearly established system of super- and subordination in which there is a supervision of the lower offices by the higher ones. . . .

III. The management of the modern office is based upon written documents (the "files"), which are preserved in their original or draft form, and upon a staff of subaltern officials and scribes of all sorts. The body of officials working in an agency along with the respective apparatus of material implements and the files, make up a *bureau*. . . .

IV. Office management, at least all specialized office management—and such management is distinctly modern—usually presupposes thorough training in a field of specialization. . . .

V. When the office is fully developed, official activity demands the *full working capacity* of the official. . . . Formerly the normal state of affairs was the reverse: Official business was discharged as a secondary activity.

VI. The management of the office follows *general rules*, which are more or less stable, more or less exhaustive, and which can be learned. Knowledge of these rules represents a special technical expertise which the officials possess. It involves jurisprudence, administrative or business management.

The reduction of modern office management to rules is deeply embedded in its very nature.[7]

Weber's rational-legal ideal type was meant to indicate how bureaucracy could replace personalistic, patrimonial, patriarchal governance in society and economy.

James March and Herbert Simon argued the impossibility of developing principles that would guide the structuring of organizations.[8] Such

principles were a mainstay of classical management theory and had guided the development of the American state during the first half of the twentieth century.[9] Richard Cyert and James March, analyzing firm behavior, laid out the elements of bureaucratic politics by showing how individual actors pursue their interests and goals apart from compliance with an overarching organizational goal or mission.[10] Graham Allison developed these ideas from organization theory to explain the role of organizational processes and bureaucratic politics, or the seemingly uninterrupted bargaining among government officials, that typifies government decision-making.[11] James Q. Wilson, also drawing upon these theoretical streams, notes what every student of government and organizational behavior knows, that some agencies adhere to rules, but many do not.[12] The balance of powers articulated in the Federalist Papers by James Madison constrains agency behavior to a greater extent than conformance to rules. That Weber's ideal-type bureaucracy masks a startling variety of bureaucratic forms and practices, in their details, is an important one. One of the most important limitations of the Weberian framework is the absence of flesh and blood—that is, a view of government decisionmakers and their activities even in highly bureaucratized organizations.

The modern American state is a bureaucratic state. Researchers cannot theorize the role of information technology in the bureaucratic state without paying considerable attention to its structural elements. Fundamental concepts of governance follow logically from Weber's conceptualization, including jurisdiction, hierarchy, merit, documentation, and professional training in administration. If bureaucracy is outmoded or deficient, which of these elements has changed? As James Beniger observes in his masterly analysis of control systems:

> Few turn-of-the century observers understood even isolated aspects of the societal transformation . . . then gathering momentum in the United States, England, France, and Germany. Notable among those who did was Max Weber (1864–1920), the German sociologist and political economist who directed social analysis to the most important control technology of his age: bureaucracy. . . . Weber was the first to see it as the critical new machinery for control of the societal forces unleashed by the Industrial Revolution.[13]

Although bureaucracy has been prevalent in all major ancient civilizations from ancient China to Rome, it did not assume its modern legal and rational form in the United States until late in the American industrial revolution. The development of the railway produced a complex

transportation system in need of control and coordination—that is, administration—to prevent fatal railway accidents and serious economic losses in business.[14] No such administrative systems existed. They were developed as a necessary response to technological change. Weber's conceptualization of rules, rationalization, and their effect on behavior and social relations is as vital today to understanding the modern state as it was nearly a century ago. We have no comparable framework to guide the transformation of the state as a consequence of the information revolution.

Weber's definition of bureaucracy underlies the structural logic of the bureaucratic state in the twentieth century. His delineation of jurisdiction supplies the kernel from which theorists for the past eighty years have developed the normatively and theoretically powerful concepts of division of labor, functional differentiation, and, as a result, clear jurisdictional boundaries in government. Jurisdictional boundaries guide not only agency structure but also the organization of the budget process, oversight agencies, and congressional committees. If the Weberian concept of jurisdiction is changing, what form will jurisdiction take in the virtual state?

Weber's second characteristic, hierarchy, forms the essence of bureaucracy for many theorists. Herbert Simon, a key theorist of both bureaucracy and digital information processing, traces the dominance of hierarchy through a variety of natural as well as social systems.[15] Simon argues that hierarchy as a structural form encompasses and enables the decomposability of complex problems. The ability to factor complex problems, to assign the factors to specialists to solve, and then to recombine partial solutions is the chief reason that bureaucracy supersedes other forms of complex organization. Simon offers as evidence of superiority not only greater efficiency of output, but also the exceptional robustness of decomposable systems to withstand and recover from interruptions and disruptions from a variety of sources. Complex problems might also be factored and decomposed in network structures, although the ordering provided by hierarchy would have to be replaced with significant, perhaps overwhelming, mutual adjustment processes or other rules. A different type of coordination and control would have to replace hierarchy. Although the Internet and the web provide superior communication and coordination capacities, they do not replace hierarchy.

The third chief characteristic of bureaucracy, according to Weber, the "files," constituted an important departure from idiosyncratic, personalized decisionmaking that needed no documentation. As bureaucracy became central to the modern state, for example, tax collectors in England

could no longer individually define their operational methods. Written rules and the evolution of standard operating procedures, stored in files, furthered the rationalization of the state and the economy. Consistency of professional behavior through adherence to rules is the basis for complex, wide-ranging financial, legal, political, and social systems. Monitoring and sanctions put force into rules, but most actors most of the time follow the rules out of habit or a sense of obligation, professionalism, citizenship, or other positive norm rather than because they fear the imposition of sanctions if they do not. The absence of widely accepted rule regimes—or widespread failure of actors to abide by rules—constitutes a key reason for delayed development in many societies. As we will see in the chapters that follow, the use of networked computing requires many more rules than are currently needed in government because computers, as binary processors, require rules to work. That more rules, and greater standardization across rule systems, will accompany wider use of the Internet in government is clear. The content and implications of those rules is not.

Weber normatively delineated the bureaucrat as neutral with respect to organizational goals and direction, impersonal with respect to the application of law and administrative regulations, and technically expert in the conduct of a particular, clearly defined office. Although many theorists have discounted the concept of bureaucratic neutrality, it remains normatively powerful in the American state.[16] Indeed, neutrality is a key feature of professionalism within every democratic civil service in the world. It is difficult to imagine a civil service in a democracy without a strong norm of neutrality. In a virtual state, where citizens are as likely to interact with private sector employees as with civil servants in conducting their web-based services and transactions, it is not clear whether the norm of neutrality will be replaced—or can be replaced—by embedded rules or standard operating procedures.

Finally, Weber characterized the rationalization of bureaus and offices increasingly ordered by rules and procedures. He feared the domination of bureaucracy as a form of control, an "iron cage," as much as he appreciated its effectiveness and potential as a rational and legal organizational arrangement of "technical superiority over any other form of organization."[17] Weber's then-radical perspective captured, and abetted, the transition from patriarchal, patrimonial, intensely political, and personal systems of state organization to the rational, impersonal, efficient, rule-based bureaucratic state. Every democratically governed industrial nation organizes as a bureaucratic state following the form delineated by Weber.

The modern American state reflects the ideas of both Weber and Frederick Taylor. Weber might never have held a central role in the development of the modern state in the United States if not for the complementarity between his ideas and Taylor's. In 1911, Frederick W. Taylor published *The Principles of Scientific Management*, a highly normative method of rationalization in industry and government. The essence of Taylorism consists of efficiency gains in production processes through control over the work force and the design of work.[18] Workers were assumed by Taylor to be uninterested and unable to analyze their own task environment, but motivated by money. A reward system based on the number of pieces produced would ensure conformity and speed in the production process. Scientific managers in government eagerly set about the organization of the modern American state as bureaucratic agencies with machinelike, rational, Weberian elements.[19]

Politics and administration would never overlap or compete in such a system. Legislators could pass laws to stipulate ends; administrators would use professional expertise to determine the "best," defined as the most efficient, means toward given ends. The convenient fiction of the policy-administration dichotomy, introduced by Woodrow Wilson, administrative theorist as well as president, helped reassure legislators that a growing state bureaucracy and professional civil service could be developed that would remain utterly subordinate, accountable, and responsive to them and thus to the electorate. According to Taylorists, close observation and rational analysis of any production process would indicate the "one best way"—or the rules—for performing the tasks of a job. Neutrality and rule systems in administration could be combined with neutrality and rule-making in scientific management to produce efficiencies in government. In order for the bureaucratic state to replace a state of parties and courts in late nineteenth- and early twentieth-century America, the relationship of the bureaucracy to Congress had to be clearly negotiated.[20] If the virtual state involves restructuring bureaucracy, this, too, would require considerable political negotiation with Congress and the judiciary to recalibrate the balance of powers.

Taylorism combines two dominant streams in American administrative thought: "the 'good man' approach" and a structural bureaucratic perspective that views people in their positions, or roles, primarily as components of organizational structure. Efficient structures could be achieved through the accurate classification of workers according to demonstrated ability and through coordination of labor: "From positions—abstractly, impersonally defined, in the manner of Weber's ideal bureaucratic type—one can build structures."[21] The deeply entrenched focus on job and position description and complex classification systems, which continued until the 1990s, indicates the institutionalized value within public administration of position, rather than person, as the fundamental structural component of the bureaucratic state.[22] As Gerald Garvey, a historian of public administration, notes: "The Taylorite world was bureaucratic in its very essence. For bureaucracy is, essentially, a means of combining capacity (in circumstances requiring coordination of many different skills and functions) with control. Control is achieved through hierarchical supervision and administrative direction."[23] So we see that Weber's ideal-type bureaucracy greatly informs scientific management and the development of the American bureaucratic state.

Central Elements of Bureaucratic Structure

Weber's ideal type provides a powerful vantage point for examining the bureaucratic state, but his broad conceptual framework requires more detail to be useful for our purposes. If the use of the Internet by bureaucratic policymakers were simply a matter of increasing rationalization in the bureaucracy, the logics would be perfectly aligned. The classical function of organizational structure has been to facilitate the division of labor through departmentalization, task specialization, and standardization. Coordination is achieved through hierarchy, formalization, and socialization. We will hold aside the imperative for bureaucracies to define their boundaries and to formalize relationships with other organizations in their environment. One of the central tasks of public administration and management is the design and maintenance of effective organizations, in part through the repeated reorganization of structural elements as well as coordination, function, and process flows in more or less systematic channels through which move information, activity, production, and decisionmaking.[24]

Coordination

One reason for the powerful potential effect of the Internet is its ability to affect not only production but also coordination. Therefore, this element of bureaucracy is of vital importance if we are going to understand how the use of the Internet by bureaucratic policymakers is mediated by

existing structural elements. The division of labor and functional specialization quickly create requirements for coordination.[25] Formal and informal coordination mechanisms range from mutual adjustment among individuals, to supervision, to rationalization (or standardization) of inputs, outputs, and even individuals through training, education, incentives, and indoctrination. These mechanisms, whose combinations in complex organization are legion, glue together the boxes on the organization chart, the basic parts of the organization.

Studies of the brain indicate that complex coordination is achieved through the cognitive capacity of one individual working alone. Dyads and small groups use informal means, primarily discussion and nonverbal communication, to coordinate their tasks. A group may informally elect a leader to coordinate its activities through direct supervision. As larger groups undertake more complex problem-solving, however, coordination typically requires standardization.

MUTUAL ADJUSTMENT. Although it is currently fashionable for researchers to inquire into self-regulating systems and the relationship between the organizing behavior of neural networks and social networks, these ideas, however important, are not new. Economists have always understood the action of "the invisible hand," yet students of government tend to pay short shrift to the role of mutual adjustment as a powerful and ubiquitous means of coordination. This is important to the overall argument of this book because no conceptualization outlines the relationship between widespread use of information technology in government and the role of mutual adjustment. On the one hand, improved communication and shared information could vastly increase the importance of mutual adjustment. On the other hand, if rigid rules were programmed into information systems, mutual adjustment would lose force as a source of coordination.

In his exploration of the uses of mutual adjustment in governmental decisionmaking, Charles Lindblom argued that "there are no coordinators in partisan mutual adjustment; such coordination as is achieved is a by-product of ordinary decisions, that is, of decisions not specifically intended to coordinate. *For partisan mutual adjustment, therefore, to study coordination is to study decision making generally. . . . For partisan mutual adjustment, therefore, to study coordination is to study rationality.*"[26] If we accept these claims, and I do, then we cannot circumscribe and dismiss mutual adjustment as an informal mechanism working at the margins of formal rule regimes.

Lindblom's use of partisan mutual adjustment at first glance falls into the pluralist, bargaining tradition in American politics. However, he carefully delineates the interplay among authority, rules, and mutual adjustment—a more sophisticated rendering than accounts of simple bargaining or bureaucratic politics: "The behavior of each participant (including each citizen) in the governmental process is greatly controlled by conventions [rules] about ends and means that have the effect of prescribing behavior conditionally or absolutely."[27] With specific reference to agencies, he argues:

> Each agency possesses and employs governmental authority over some participants in the governmental process (officials, agencies, non-official leaders, citizens), restricted and specialized, however, to its policy-making area. While in its area of specialization each agency makes policy decisions, some agencies also confer governmental authority on other agencies; and, of those that do, all make some decisions designed to coordinate the agencies on which they have conferred authority, and all occasionally prescribe a particular decision to such an agency.[28]

Thus, partisan mutual adjustment, far from a bargaining free-for-all, is always embedded in systems of rules, including rules regarding jurisdiction and authority. Lindblom's analysis anticipates recent scholarly attention to the embeddedness of strategic behavior. When bureaucratic policymakers negotiate the best, appropriate, feasible, or acceptable uses of the Internet in their agencies, their mutual adjustment takes place within nested systems of rules that constrain both the innovations considered and the interests agency actors negotiate for.

SUPERVISION. Although substantial empirical research analyzes the behavior of supervisors, their relationship to operators, and other important characteristics of this role, these things are not relevant to this discussion of bureaucracy because direct supervision requires one person to take responsibility for the work of others by assigning them tasks and evaluating their performance.[29]

Two schools of thought regarding organizational structure coexisted until the 1950s. Classical management theorists, who dominated public administration, focused their attention on the structural properties of direct supervision, the design of official authority and functional relationships, and their optimal organization in the federal bureaucracy. The "principles of management" school provided the central concepts that guided the design of

U.S. military organizations, firms, and public agencies: unity of command (the presumption that a subordinate should answer to one and only one superior), the superiority of the scalar chain (or chain of command), and a preoccupation with the optimal span of control under various organizational conditions. Many government and military officials to this day have been socialized to adhere to principles articulated in the 1930s by classical management theorists such as Luther Gulick and Lyndall Urwick.

Their ideas produced the deeply embedded notion of highly delineated roles and functions circumscribed within a clearly specified authority structure in the bureaucratic state. These ideas transcended their use as principles of management to become norms of good government and professional public management. They are deeply institutionalized in American government. Decisionmakers, analysts, and legislators continue to regard mutual adjustment and the entrepreneurial and political tasks required of every bureaucrat as deviations or problems to be rooted out and remedied by additional controls and rules. So, one finds competing logics and principles that have become values even within the broader logic of bureaucracy. When structural design principles become suffused with value to connote good government and professionalism, they become more difficult to change even when the rational reason for their existence no longer holds.

STANDARDIZATION. A third form of coordination, standardization, was identified by Weber as a form of rationalization essential to bureaucracy. Beniger uses the computer science term "preprocessing" to denote standardization:

> [Coordination] can be increased not only by increasing the capability to process information but also by decreasing the amount of information to be processed. The former approach to control was realized in Weber's day through bureaucratization and today increasingly through computerization; the latter approach was then realized through rationalization, what computer scientists now call preprocessing.[30]

Standardization, then, reduces the variance of inputs, outputs, activities, and behaviors. The current interest in performance measures in public and private management, an exercise in bureaucratic standardization, is part of an effort to improve agency coordination and control and, thus, output and productivity. The Government Performance and Results Act

(GPRA) requires agency officials to identify key measures (standards) and to develop means to monitor their progress. A central feature of the new public management (NPM), a school of thought sweeping through bureaucracies in governments around the globe, recommends linking budget flows to the achievement of performance measures: a most Weberian rationalization exercise. These examples demonstrate clearly the vitality of Weberian rationalization as a means of control and performance improvement in government.

According to March and Simon, who analyzed the development and use of standardized operating procedures and performance programs—or repertoires of routines—in complex organizations as organizing devices: "The coordination of parts is incorporated in the program [for the work] when it is established, and the need for continuing communication [or supervision] is correspondingly reduced."[31] March and Simon focused on the standardization of work processes, but inputs to decisionmaking or production processes, as well as outputs in the form of products, reports, figures, and services, are typically standardized, or preprocessed, as well. Within computer programs and operating systems, the choices made by designers standardize work processes by limiting, or preprocessing, the options and choices of users, and by forcing users to follow decision trees and paths by using the menus and formats provided.

THE STANDARDIZATION OF PEOPLE. Standards may be socialized into people, just as they are into work processes and equipment, through selection methods, training and education, appraisal, and incentive systems that reward standard behavior and punish deviations. An equally strong but more subtle "preprocessing" occurs in professional and university graduate programs where aspiring professionals are trained to focus on particular variables or concepts (and to ignore others), to use standard procedures for analysis, and to use preprogrammed formats for writing and presentation. Socialization, as a form of standardization, provides stability and uncertainty reduction, forms of rationalization that are essential in bureaucracy. Yet the socialization of professionals constitutes a form of "impairment" that constrains inquiry and at times impedes the resolution of complex social problems.[32] For our purposes, it is clear that the socialization of individuals means that new information technologies and their use in government will be perceived through standard lenses that will in many cases bias innovation in unanticipated ways to conform to existing structural and political arrangements.

Hundreds of forms of standardization used throughout bureaucracies, from minute inputs to the regularized flow of information and decision-making to the socialization of professionals, produce not only coherence, stability, certainty, and coordination but also impairment, lack of creativity, groupthink, and resistance to change. Given its predominance in bureaucracy, a rational observer might overstate the degree of standardization in government bureaucracies. Yet in spite of vast efforts at rationalization, mutual adjustment is always necessary to achieve even minimal coordination.

Bureaucratic Functions

Weber had little to say about functions in bureaucracy, but a large body of research in social psychology, industrial relations, and political science analyzes the functional roles of organizational actors. James Q. Wilson organizes his volume *Bureaucracy* in terms of "operators," "managers," and "executives" in order to examine bureaucracy from functional positions rather than from Weberian structure. Studies of bureaucracy usually treat structure and function separately, but separation makes it impossible to examine functions within their structural constraints and divorces actors from the rules that shape their behavior.

In most complex organizations the primary functional actors include: operators at the base of the traditional pyramidal organization; executives responsible for setting direction, strategy, and relations with the external authorizing environment; managers who connect operators with the executive; technical analysts, including auditors, operations researchers, scientists, engineers, and specialists; and support staff with responsibility for activities such as congressional and media relations, human resources, and legal services.[33] The effects of the Internet on all these functional actors will differ. It is likely that operators will lose control over their work because information systems are used to monitor and report exceptional behavior upward. Program, or line, managers traditionally have helped coordinate the work of operators and other managers. Although Leavitt and Whisler's prediction of the demise of the middle manager, made in the 1950s, took nearly thirty years to come to pass, it is indeed the former sorters, collators, and report writers at the middle levels whose numerative tasks have been automated. Executives may gain tremendously from powerful systems that feed them information from throughout the organization. At the same time, if information is widely shared executives lose a form of power. In addition, in a world full of information, executives are in danger of persistent overload. In sum, one

can hypothesize that technology use can have either positive or negative consequences, depending on whom it affects. Turning the equation around, one might expect each functional group to try to implement new information systems to benefit their function. At a minimum, this tells us that design and use of the Internet would be a source of negotiation and political contest, the results of which have implications for authority, power, and resource distribution.

The hierarchical distinctions among managers constitute an administrative division of labor in the bureaucracy. Analysts have traditionally been responsible for standardization within bureaucracy. Some analysts rationalize work processes, thus removing discretion and variance from the tasks of operators and program managers. In the U.S. government, the redesign of "business" processes and other efforts to rationalize work processes have been carried out variously by teams of operators and managers, by internal analysts, and to a large extent by private sector consultants—or a combination of all three. Other analysts, such as accountants, planners, production specialists, and logisticians, standardize agency outputs. Human resource specialists and other technical staff standardize employee skills. As these outputs have been further rationalized using information technology, the need for in-house analysts has decreased. Generic functions and tasks are easily outsourced.

Among their other critical functions, analysts design systems that coordinate activities and thus reduce the need for management. Systems analysts, for example, who design computer programs and applications, play a key role in standardization. These distinctions between analysts and other managers are important ones missed in many studies of bureaucracy.

A large proportion of government managers (that is, those with responsibility for functions including research and development, legal affairs, public relations, payroll, maintenance, security, and legislative relations) are considered staff in the traditional production firm because in those firms they are removed from the basic flow of work. In government, however, these functions are central, and so the work of public managers in these functional areas is the central flow of work. Agencies can be distinguished according to whether they perform a service delivery or a "banking" function that includes not only financial responsibilities but also regulation and evaluation. Service delivery agencies typically interact with citizens directly even if through a complex line of contractual relationships. Other agencies are, in essence, the support-staff agencies of the federal government. During the past two decades, generic support

functions have been privatized, moved out of the bureaucratic state. Further use of the Internet to link government organizations with the private sector will inevitably increase this trend, with implications for both the size and the nature of government. In sum, from a functional perspective, vertical compression in management brought about by the implementation of information technology has changed the shape of bureaucracy from a pyramid to an hourglass.

Bureaucratic Flows

In the mid-1980s, government managers became particularly interested in process flows in organizations. Total quality management and business process redesign, two leading management ideas from the 1980s, made strong claims that dramatic efficiencies could be achieved by reducing the friction in flows of work across functional, jurisdictional, and other boundaries. Mapping business processes "horizontally" across functional units provides an important source of information about potential efficiencies and promising innovations in the design of work flows. Before the widespread use of the Internet, the development of shared databases across functions and jurisdictions led to the redesign of business processes by automating flows of information so that distributed decisionmaking could occur.[34] This massive shift from linear, sequential processing of information to parallel, shared processing using networked computing has dramatically changed the flow of work, and thereby the structures and roles in government. Yet to date, process redesign has affected operators and managers far more than executives.

The formal organization chart has been a mainstay of federal agency structure. Rules that govern the formal flow of information, work, and decisionmaking coordinate organizational units and functions. Flows of authority, work, control, and staff information circulate in all directions throughout the organization. Though the organization chart reveals some aspects of the flow of formal authority—that is, the flow downward of commands and the flow upward of information—it does not reflect informal influence or power structures or the actual everyday pattern of work and decisionmaking. Formal authority structures are only partial structures, but they guide formal behavior directly, influence informal social and political processes, and require at least the appearance of conformity. In those ways, they structure the agency. Much of the history of federal bureaucratic reform in the twentieth century consists of moving the boxes on the organization chart rather than on process analysis and redesign.

The National Performance Review reforms focused on redesigning process flows rather than on the more political and difficult structural reorganization that typically signals reform.

Command and control, as the term is traditionally understood, comprises a set of largely vertical flows. Decisions made at the top of the organization are decomposed into performance objectives and plans by analysts or managers and then filtered down the hierarchy to the operating levels. As a complement, control systems gather information about outputs and feed this upward to the executive levels for planning. March and Simon's analysis of these social information processes in organizations (though written in the 1950s, before substantial computer use in bureaucracy) explains the intricate interplay between individual cognition and organizational structure. Their concept of "uncertainty absorption" is central to understanding information processing in agencies:

> In our culture, language is well developed for describing and communicating about concrete objects. . . . On the other hand, it is extremely difficult to communicate about intangible objects and nonstandardized objects. Hence, the heaviest burdens are placed on the communications system by the less structured aspects of the organization's tasks, particularly by activity directed toward the explanation of problems that are not yet well defined. . . . The use of classification schemes in communication has further consequences. . . . The technical vocabulary and classification schemes in an organization provide a set of concepts that can be used in analyzing and in communicating about its problems. . . . Hence, the world tends to be perceived by the organization members in terms of the particular concepts that are reflected in the organization's vocabulary. The particular categories and schemes of classification it employs are reified, and become, for members of the organization, attributes of the world rather than mere conventions. . . . Uncertainty absorption takes place when inferences are drawn from a body of evidence and the inferences, instead of the evidence itself, are then communicated. . . . Through uncertainty absorption, the recipient of a communication is severely limited in his ability to judge its correctness.[35]

An equally important system of processes guides the flow of work, information, and decisions in government agencies. The critical notion behind organizational redesign according to process flows—or reengineering—is that productivity enhancement efforts within subunits are stymied if the

flow of information and work across subunits and functional areas is ineffective and inefficient. The key design components are not the boxes on the organization chart but the elimination of barriers between the boxes.

Weber Redux

Would Max Weber recognize the current U.S. bureaucracy as a bureaucracy? Undoubtedly. Has jurisdiction disappeared? By no means, although some jurisdictional boundaries have changed character. If we compare the classic elements of bureaucracy with the structural elements that are developing in the wake of technological changes, several broad differences come to light (see table 4-1).

It is difficult to imagine the federal bureaucracy organized into anything but agencies, although their structure and relationships within and outside the government are changing. Similarly, large private sector corporations form alliances and use technology extensively to improve information processing but remain large bureaucracies with characteristics Weber would recognize. In fact, recent antitrust rulings and a more powerful capacity for coordination and control through technology and management systems have led to the creation of huge global firms through a stream of mergers and acquisitions. Professional and operational roles still exist, although many have become broader and more fluid. In spite of some "flattening" of hierarchical structures and loosening of command and control systems, hierarchy remains central to most complex organizations. An important question for students of bureaucracy concerns the optimal, or appropriate, degree and use of hierarchy in information-based organizations. A shorter chain of command in several bureaucracies is evidence of the natural experiment currently under way. The rapid rise of scholarly interest in network forms, both within and between organizations, has obscured the fact that most nodes in networks continue to function within hierarchies. Digital files structured as shared databases make data and information available throughout bureaucracy rather than only to those at particular levels who perform specific functions. A notable result has been the detachment of information from individuals holding a particular role. To the extent that information is power, this fundamental structural shift has important implications for authority and power in government. Much has been written about the assumed democratization expected to occur as a result of information sharing and transparency. But

TABLE 4-1. Comparison of Weberian and Virtual Bureaucracies

Elements of a Weberian bureaucracy	Elements of a virtual bureaucracy
Functional differentiation, precise division of labor, clear jurisdictional boundaries	Information structured using information technology rather than people; organizational structure based on information systems rather than people
Hierarchy of offices and individuals	Electronic and informal communication; teams carry out the work and make decisions
Files, written documents, staff to maintain and transmit files	Digitized files in flexible form, maintained and transmitted electronically using sensors, bar codes, transponders, hand-held computers; chips record, store, analyze, and transmit data; systems staff maintain hardware, software, and telecommunications
Employees are neutral, impersonal, attached to a particular office	Employees are cross-functional, empowered; jobs limited not only by expertise but also by the extent and sophistication of computer mediation
Office system of general rules, standard operating procedures, performance programs	Rules embedded in applications and information systems; an invisible, virtual structure
Slow processing time due to batch processing, delays, lags, multiple handoffs	Rapid or real-time processing
Long cycles of feedback and adjustment	Constant monitoring and updating of feedback; more rapid or real-time adjustment possible

Sources: Author's analysis; Nitin Nohria and James D. Berkley, "The Virtual Organization: Bureaucracy, Technology, and the Implosion of Control," in Charles Heckscher and Anne Donnellon, eds., *The Post-Bureaucratic Organization: New Perspectives on Organizational Change* (Thousand Oaks, Calif.: Sage, 1994), pp. 108–28; James I. Cash Jr. et al., *Building the Information-Age Organization: Structure, Control, and Information Technologies* (Chicago: Irwin, 1994).

most of it ignores the degree of rationalization, the rules, now firmly embedded in digital systems.

Information-based organizations and traditional bureaucracies are equally rule-based, and information-based organizations are perhaps even more highly rationalized. But the rules embedded within information systems are normally less visible and seemingly less constraining to bureaucratic discretion. Embedded rules will increasingly replace overt supervisory control and operating procedures. Indeed often so-called empowerment

represents little more than a shift from overt to covert control through embedded rule systems and peer groups.[36]

Rule-based systems are designed to support clear organizational goals. But agencies often must espouse vague, conflicting goals that result from legislative compromise and multiple missions. No amount of rationalization, either through performance measures or new technologies, has altered this fundamental political reality, and the increased rationalization of agencies is at odds with this political fact. After World War II, scholarly attention in organizational analysis turned to the dominance of the manager, a direct outgrowth of bureaucratic development.[37] An equally important though less well recognized recent development is the growth in the number of technical analyst positions required to develop, program, maintain, and service increasingly information-based federal bureaucracies. Because most information technology experts are under contract from private firms, their numbers are hidden from measures of the size of government.[38] Scholarly attention during the next decade may usefully be directed toward the growing dominance and influence of systems analysts within information-based bureaucracy and their role in the policymaking process. The externalities of bureaucratic behavior may be replaced by those of the systems analysts. I take up a number of externalities and unanticipated problems, some hinted at in this chapter, in Part II of this volume.

Clearly, the bureaucracy that formed the foundation of the modern state is now outmoded in many ways. But although modified by information technology, each of its elements remains central. The growth of networks, partnerships, and negotiated collaborative arrangements of various kinds—the subject of the next chapter—presages changes in jurisdiction, hierarchy, boundaries, and agency autonomy. Change that affects the deeper structures of the bureaucratic state will require considerable political negotiation and cultural change. In this chapter I have laid out a mechanical perspective on organizational structure with no mention of political or social organization: culture, leadership, loyalty, socialization. In fact, the characteristics of the individuals who use technology—their values, cognition, motivation, interests—have barely been considered.

In sum, the use of the Internet in bureaucracy is likely to lead to greater rationalization, standardization, and use of rule-based systems. The rules may not be visible because most of them will be hidden in software and hardware. But they will remain and may increase in power. Technology might be enacted to facilitate collaboration, shared information, and enhanced communication. Equally plausible, it may be designed and used coercively to promote conformance and control. But bureaucracy, in either rendering, has not diminished in importance.

Having unpacked the elements of bureaucracy, we can discuss them and their relationship to technology with greater clarity and precision. As we will see in the next chapter, a vast increase in the use of networks has changed but has not diminished the importance of bureaucracy.

CHAPTER FIVE

Interorganizational Networks

ALTHOUGH SOME ELEMENTS of the American bureaucratic state changed over the course of the twentieth century, most remain firmly fixed. In fact, as Chapter 4 described, the Internet is being used in American culture and the political economy to rationalize and further embed rules rather than to eliminate them. Rules embedded in computer code govern invisibly and powerfully.[1] The prevalence and clear necessity of mutual adjustment in every bureaucracy contrasts with efforts to dampen discretion and to control individual behavior, often through the design of information systems.

This chapter dissects interorganizational networks in order to examine the relationship between networks of organizations and networked computing. What are they? How and why do they form? What holds them together in the absence of hierarchy and a formal governance structure? How do actors in interorganizational arrangements use networked computing? Are networks replacing bureaucracy or coexisting with it? Is the bureaucratic state becoming a network state? Are networks changing bureaucracy as their use increases? What role do digital and interorganizational networks play in institutions? Close examination of interorganizational networks is necessary for researchers and policymakers to better understand how networked organizations and network computing interact. With few exceptions, these interactions have not been examined in previous studies.[2] Finally, we will want to examine the implications of the increasing use of networks for the structure of the state and the policymaking process.

An interorganizational network has been defined as "any collection of actors ($N \geq 2$) that pursue repeated, enduring exchange relations with one another and, at the same time, lack a legitimate organizational authority to arbitrate and resolve disputes that may arise during the exchange."[3] More simply, interorganizational networks can be said to be "the relatively enduring transactions, flows, and linkages that occur among" organizations.[4] In contrast, networks within hierarchies, or intraorganizational networks, subsume relations between and among actors under a governance structure that handles conflict resolution and channels behavior. Interorganizational network forms include "joint ventures, strategic alliances, business groups, franchises, research consortia, relational contracts, and outsourcing agreements," as well as interagency and intersectoral arrangements in government.[5]

Economic relations, as conceptualized in neoclassical economics, exist only for the transfer of goods or services and remain in effect only during the course of that transfer. More enduring relations entail obligation, trust, and calculations that do not overly discount the future and more accurately characterize most professional networks, especially those in government. As Mark Granovetter and other sociologists, economists, and political scientists have come to recognize, economic action is embedded in a rich structure of ongoing networks of relationships.[6]

Neither Market nor Hierarchy?

Organizational arrangements that resemble networks more than hierarchies or markets are becoming increasingly visible, although they have a long history that predates the Internet.[7] During the 1980s, the success of Asian firms relative to that of U.S. firms led scholars and practitioners to examine the networks used in some Asian economies.[8]

Networks came under attack when "markets" and "hierarchies" were characterized as pure forms of organization, combinations of which produced hybrid or intermediate arrangements.[9] Oliver Williamson argued that most organizational arrangements would cluster near the endpoints of a continuum between markets and hierarchies rather than between the two. As an empirical phenomenon, networks have proliferated in the U.S.

economy. Moreover, the growth of strategic alliances among firms has contributed to the visibility and perceived attractiveness of networks in government and between the public and private sectors. Some analysts estimate that by 2002 alliances among the largest one thousand U.S. firms will account for 35 percent of the total revenue of those firms. In 1980 alliances accounted for less than 2 percent of total revenues; in 1997, 21 percent.[10] One report estimates that between 1985 and the mid-1990s the rate of strategic alliance formation increased by 25 percent per year.[11]

A direct connection exists between Williamson's theoretical contributions to economic organization and the burgeoning literature on privatization and new public management. Transaction cost economics and to a lesser extent principal-agent theory are built on the presumption of the dichotomy between markets and hierarchies and neoclassical rational-actor models.[12] Heightened attention to "marketization" in government implied reduced attention to the development of interorganizational networks as a means to promote adaptive capacity, innovation, efficiency, and reduced transaction costs. In contrast to Williamson's approach, some scholars have argued that benefits inherent in the network form led to its prevalence and that the network possesses efficiencies and other benefits not possible within either hierarchy or market. Walter Powell argued that the network should be regarded as a distinct organizational form, conceptually and theoretically equal to hierarchies and markets and possessed of its own logic.[13] The comparative advantage of the network, he argued, is the chief reason for the ubiquity of the form.

The social structure of bureaucracy—that is, flows and networks of informal communication, influence, and advice—is as important to the policymaking process as the formal structure. In major studies of policymaking, Edward Laumann, David Knoke, and other researchers have empirically demonstrated that networks of actors across agencies and in the nonprofit and private sectors are more central to policymaking than formalized governance structures alone. They argue that the state is organized as policy networks.[14] Other researchers have similarly documented the prevalence and importance of social networks in policymaking. Hugh Heclo has argued that both appointees and bureaucrats must build constellations of professional and personal contacts, "the personalized networks that honeycomb the bureaucracy," in order to be effective policymakers.[15] Ronald Burt has demonstrated empirically that power, in the form of social capital, accrues to individuals who straddle and broker among disparate professional networks. Individuals in these positions possess access to especially useful information unavailable to those working within one network and can play a brokering role among structurally distinct network constellations.[16]

Network analyses and ethnographic studies of professional behavior in bureaucracies provide evidence that structured yet informal social networks of communication, advice, and influence have distinctive mediating effects on exchange relations, contracting, and economic behavior.[17] Informal networks operate outside formal organizational flow patterns and are indispensable to professionals. The Internet has strengthened the importance and use of informal networks, although it has not replaced the importance of face-to-face contact or geographic proximity in the building of trust and social contacts.[18]

Central Elements of the Interorganizational Network

Sociologists and anthropologists have long studied social networks of individuals, but the systematic investigation of interorganizational networks is a more recent development. The ability of actors to coordinate activities, to develop a form of governance that is neither market-driven nor hierarchical, and to pursue complex joint initiatives presents a set of conceptual puzzles that challenge bureaucratic notions of organization, rational action, and self-interest. If networked computing enables more extensive use of interorganizational networks, then questions of network management, administration, and governance present challenges of the first importance for government.[19]

As the empirical evidence presented in the following chapters shows, neither the Internet nor the presence of a network of organizations ensures collaboration. Many networks are highly conflictual, mired in contractual disputes and lack of coordination.[20] Indeed, conflict has been the dominant perception of interorganizational "coordination" in public policy and management.[21] However, those networks in which a threshold level of trust and cooperation is developed and sustained generally have lower transaction costs, better resource sharing, increased learning among network partners, and greater levels of innovation.[22]

Interorganizational networks vary greatly by type, environment, and quality of relationship. Although researchers continue to search for the holy grail of productive cooperation and coordination across organizational boundaries, they have not reached consensus on the conditions that promote or discourage network formation and effectiveness.[23] Organizations

may develop network relationships for various reasons. The environment in which they exist affects both their likelihood of success and the type of network developed.[24] Many government organizations are required by law or regulation to work across boundaries and develop networks out of necessity. Law enforcement and environmental organizations at the federal, state, and local levels must cooperate under certain specified conditions. Similarly, environmental protection agencies at each level of government coordinate many of their activities by law.[25]

A rational-actor typology of network formation developed by Christine Oliver indicates that individual organizations form strategic alliances and coordinated relationships to overcome asymmetries; for example, community-level nonprofit organizations associate with one another as part of the United Way to organize fund-raising and to gain the benefits of scale the association provides.[26] Firms join industry associations to increase their individual power in negotiations with government, unions, and other interest groups. Rather than leaving the flow of benefits to chance or goodwill, reciprocity ensures that benefits from coordination flow to each organization. Organizations form networks to pool resources and share administrative costs. They use collective action to stabilize resource flows, cycles, and other uncertainties by standardizing procedures. Participation in joint, cooperative associations, federations, and programs also confers legitimacy and visibility on member organizations because organizations, like individuals, are judged by the company they keep.

Continuing this typology, firms enter joint ventures to increase their power in the market; to develop barriers to entry; to share information, skills, and technology across organizational boundaries; to leverage new knowledge; and to pool risk. Trade associations form to increase their individual members' influence in lobbying state regulatory authorities. Cooperation among organizations within such associations both provides benefits to individual organizational members and enhances the image or legitimacy of the member organizations. A joint approach to negotiations with government reduces the uncertainties of the legislative process by maximizing the influence each organization can exert. Economies of scale allow the association to achieve economic benefits for members, including those from procurement, insurance, and pension plans. Volunteer and nonprofit organizations form networks for similar reasons. Collective efforts increase the effectiveness of fund-raising campaigns, save money on advertising and operations, and rationalize funding flows to member organizations. The network increases their visibility in a community and

facilitates the presentation of a united front in negotiations with community governments and other organizations.

Despite these rationales for and determinants of networks, it has been shown that relatively few interorganizational networks succeed. Although rationality should lead to many forms of interorganizational networks, the failure rate of networks is reportedly high. One example is strategic alliances between firms, which are formed for the rational reason of "achieving competitive advantage for the partners . . . when any single firm finds it either too difficult or too costly to pursue worthwhile business objectives on its own." In spite of high and growing formation rates, the failure rate of such strategic alliances is also high.[27]

The objectives of interagency networks in government are similar to those of firms, if we substitute superior policymaking for increased capacity for competitiveness. But the structures of incentives, rewards, and risks operate differently within government. Strategic alliances in the economy may be broken when the contractual period expires, not always cleanly or simply but more easily than in the government. Government budget appropriations are more difficult to rescind once they have been used to establish programs. In purely strategic terms, firms enter alliances to maximize gains from other firms by gaining access to otherwise unavailable resources. In this exchange model of network formation, no synergies from the relationships are calculated, nor is social capital, a benefit derived from cooperative productive capacity. Institutionalists find a purely calculative explanation of network formation and persistence inadequate because it fails to account for the embeddedness of economic action in ongoing structures of social relationships and for the benefits of networks typically ignored by simple exchange models.

Policy and politics researchers continue to lament the difficulties of cooperation, although a burgeoning stream of research on partnerships documents either a more optimistic perspective or an actual change in the cooperative behavior of organizations. But social science, policy, and public management research is silent (with a few exceptions) on the question of what would happen if potential network actors could be linked digitally. It is also not known whether tight economic resources during the 1980s led to greater pooling of organizational capacity, whether the example of Asian networked firms traveled to the United States, whether rapid changes in the American economy led to a greater need to pool resources and talent, whether information technologies reduced coordination and communication costs enough to make networks more feasible, or

whether some combination of these environmental and technological factors led to behavioral change.[28] It is the case, however, that the use of interorganizational networks has grown dramatically.

Empirical research has established a set of conditions that aid the formation of cooperation. When actors conduct a series of transactions over time and thus form a relationship, they are able to test each other's reputations for fairness and reliability.[29] Elinor Ostrom found that successful cooperative arrangements in governing the commons tend to have a limited number of players and thus allow information about reputations and transactions to be easily shared within the network. The successful formation of cooperative networks requires that actors value the long-run network relationship highly enough to divert resources and attention to network formation and to forgo immediate individual gains. The boundaries and objectives of the network are typically clearly defined, and sometimes it is important for participants to define the rules under which they will cooperate. Well-performing networks develop conflict resolution mechanisms in order to resolve inevitable disagreements.[30] Ostrom found that successful networks develop graduated sanctions, which punish inappropriate actions in ways that preserve the network.

Rational-choice theorists recognize the possibility and stability of collective action. They have been able to do so by expanding their range of vision to encompass the development and persistence of ongoing social relations, extended reciprocity, trust, and the occasional defections that, nevertheless, allow the network to continue and retain its social capital.

Less is known about the process by which individuals actually build and sustain interorganizational relationships.[31] Process perspectives pose difficulties for research. Developmental processes must be studied over time rather than cross-sectionally. Researchers must closely and systematically observe behaviors as they unfold. In sum, research on development uses detailed analysis of cases rather than analysis of large samples. But understanding the processes successful network builders use is of central importance. For this reason, the cases in part II detail the processes of network development. Policymakers and public managers must understand how to develop and maintain networks in order to design incentives and policy instruments that encourage their formation and effectiveness in government. Government officials within interorganizational relationships also must understand key process variables in order to manage effectively in these new structural arrangements. If the virtual state is a network state that uses the Internet as a technological and information infrastructure, policymakers cannot exercise control over its development without understanding both the characteristics of networks and their developmental processes. Central to their development and maintenance is social capital.

Social Capital

Social capital is among the chief benefits of cooperation and a product of well-functioning networks.[32] The stability of relationships in networks allows actors to combine their shared knowledge, experience, and resources in new and productive ways. If the virtual state includes networks, it also will need social capital. Moreover, if networked computing is to become a vital part of the virtual state, researchers will have to clearly articulate how to build and maintain social capital using the web.

Social capital can be defined as the contribution of ongoing productive relationships to institutional effectiveness, measured by economic performance and innovation in policymaking. Relevant relationships include horizontal ties among agencies, vertical ties in supply chains, and multidirectional ties to sources of knowledge. This form of capital, as powerful as physical and human capital, is the "stock" created when a group of organizations develop the ability to work together for mutual productive gain.[33] The concept of social capital is drawn from research that demonstrates the effect of institutional and social arrangements on economic development. It has more recently been extended to explain differences in innovation rates among countries with similar capital, labor, and national resources.[34]

The notion of social capital refines concepts such as "cooperation" or "collaboration" in two significant ways. First, linking cooperation to the economic concept "capital" signals the investment or growth potential of a group's ability to work jointly. Second, the concept identifies the *structure* created from collaborative effort as capital. Well-functioning partnerships, consortiums, and networks are in and of themselves "a form of social capital."[35] Capital is located both in the sharable resources held by individual institutions in a network and in the overall structure among the organizations in a network. For example, a group of scientists who have collaborated on a relatively small scientific project may then use their collaborative ability to propose and undertake larger, riskier research projects. They may further use their network to address the economic revitalization of their community or a global problem such as nuclear weapons proliferation or climate change. Their originally small

network may be extended to members of the political and business community: small cooperative ventures may grow into more ambitious undertakings as parties learn how to collaborate productively and develop reputations for trustworthiness. Social capital, like other forms of capital, accumulates when used productively.

Robert Putnam uses the concept to explain why some government institutions succeed and others, designed similarly, fail: like "physical and human capital—tools and training that enhance individual productivity—'social capital' refers to features of social organization that facilitate coordination and cooperation for mutual benefit."[36] The central elements of social capital are trust, norms, and networks. Trust is developed over time as individuals gain confidence in the reliability of others through a series of interactions.[37] A key property of social capital rests on the transitivity of trust: *A* trusts *C* because *B* trusts *C* and *A* trusts *B*. Thus relatively large networks may exhibit generalized trust although there is little close personal contact among all members. Norms of appropriate behavior develop as a social "contract" among actors. The norm of reciprocity is fundamental to productive relationships. In politics and bureaucratic behavior this norm is known colloquially as the "favor bank."[38] Closely linked to reciprocity is a norm that actors will forgo their immediate self-interest to act not only in the interest of the group but in their own long-term self-interest.[39] Thus a reputation for trustworthiness, essential in politics and government, is also essential to actors in collaborative networks. Social capital is preserved through the careful selection of network players and the strict sanctioning of inappropriate (network-destroying) behaviors. A cohesive network develops when a group of individuals or organizations form reliable, productive communication and decision channels and a more or less permeable boundary to define members.

Traditional economic perspectives that focus on short-term self-interest and individual transactions ignore the accretion, or growth, opportunities generated by cooperation.[40] Closely related to accretion is the self-reinforcing cyclical nature of social relations. Trustful relations tend to be self-reinforcing to strengthen cooperation. Mistrust tends to cycle in the negative direction, weakening relationships and cooperation.

In contrast to atomistic perspectives that emphasize individualism, closely held information, and autonomy, social capital is an extension of perspectives in which cooperation paradoxically enhances competitiveness, information-sharing leads to joint gains, and the importance of reputation and trust ensure reciprocity and fair play within a network. Adam Smith and other classical economists of the eighteenth and nineteenth centuries recognized that an individual firm must be embedded in an underlying fabric of shared values and understanding to make division of labor feasible. Networks, partnerships, and consortiums succeed in part through the social glue that holds them together rather than through contracts that attempt to account for every contingency. And cohesion cannot be generated exclusively in digital information systems that link networks of organizations. The glue in cooperative networks includes norms of trust and appropriate behavior underlying exchange.

Economists have contributed greatly to public policy by identifying, clarifying, and sometimes finding ways around dilemmas posed by collective action problems. Although in most situations all parties would be better off were they to cooperate, collective action theory argues that, in the absence of an overarching authority to enforce appropriate behavior or clear mechanisms to ensure commitment, individuals tend not to take the risk of cooperating. None achieve gains from cooperation, and all are worse off. Drawing on the realpolitik of collective action theory, policy analysts and researchers have long argued that the coordination costs associated with interorganizational and interjurisdictional arrangements often exceed the benefits.[41] They have argued for the necessity of clear lines of authority and strong, centralized governance structures to monitor behavior and to enforce sanctions against inappropriate actions.[42]

Over the past decade or so, social scientists from a variety of disciplines, as well as an increasing number of policy experts, have sought to explain the proliferation and success of collaborative arrangements in policy settings. The broad term "social capital" captures many of the salient properties of these arrangements. Development experts note the importance of social capital as a foundation for economic development. They have documented the importance and extent of rotating credit associations—informal collective savings and loan plans—that prosper throughout the world.[43] Others have studied the collaborative stewardship of common-pool resources, such as water supplies and grazing areas, that are managed for long-term collective benefit.[44] Urban development experts in the industrialized nations have made social capital a fundamental element of policies to build and strengthen cities.[45] International relations scholars have documented the extent to which international regimes of many types are developed and adhered to in the absence of overarching authority.[46]

Networks, Technology, and Innovation

Although public-private partnerships are burgeoning, agencies typically find it difficult to work cooperatively within government. Resources are wasted and opportunities to build capacity are forgone. Eugene Bardach, focusing on partnerships in government, argues that serious policy problems go unsolved because of missed opportunities for partnership.[47] Many contemporary policy challenges span policy domains, falling outside the jurisdiction or specialized competence of any one agency. Examples include environmental challenges (air, water, and land quality and use) in large geographic areas; social policy problems (housing, substance abuse, and education and training); and development challenges that include institutional reform and cultural change as well as economic improvement.

Network arrangements in the economy have increased in the face of more rapid technological change, scarcer economic resources, and easier linkage of geographically dispersed actors. As an adjunct to internal restructuring, large manufacturers have turned to external supplier relationships and supply chain integration for inputs to the production process as well as operational and administrative functions.[48] Thus specialized technological knowledge and innovation reside increasingly in small and medium-sized suppliers whose research and development takes place in team-based configurations on the shop floor rather than in corporate laboratories staffed with scientists conducting long-range basic research. The base of technology offerings has outstripped the capacity of single firms to remain competent in the technical fields relevant to their business. In addition, investments necessary to sustain technology development and deployment have increased to the point that single firms usually cannot afford to undertake the level of risk necessary for innovation. For these reasons, networks have grown in importance. For complex production processes, suppliers function both as partners with lead firms and independently to develop and deploy new technologies.[49]

Organizations leverage their information-processing capacity through the use of interorganizational networks. Network structures are more effective than large hierarchical structures at scanning their environment for changes, interpreting environmental change, and responding to change. Better scanning means more timely and accurate problem recognition. Better interpretation enhances policy and problem formulation and decisionmaking. Greater adaptability translates into more timely innovation and better alignment with environmental conditions.

Networks in dynamic industries develop a superior division of labor and task specialization by extending some of the elements of bureaucracy across organizations. Similar logic applies to policymaking networks in government. A major difference between the sectors, however, is the ease and rapidity with which networks may form and reform. Networks in government rely on budgetmaking and oversight processes for funding, support, and legitimation. These institutional structures work too slowly and rigidly to allow network formation to develop in response to opportunities and problems. The Internet as catalyst to network formation simply makes the mismatch of speed between the institutional structures of government and the linkage afforded by the Internet more problematic. As policy environments become more turbulent and complex, the methods of dynamic industries offer intriguing possibilities for policymaking and operations in government. In addition to pooling resources, agencies increasingly require more rapid access to knowledge and stronger innovative capacity.

Access to Knowledge

Many experts regard strategic alliances as the foundation for interorganizational collaboration in the public and private sectors. Whereas large organizations in the past maintained in-house research and development laboratories in order to retain dominance in their core technologies, firms increasingly have externalized this function through cooperative agreements with other firms, government research laboratories, and universities. Most experts explain the rise in consortium activity as attempts to reduce the cycle type of innovation, to reach new markets and technologies, to share risks, and to gain complementary competencies.[50] But these explanations ignore the importance of knowledge diffusion and learning in networks.

Other researchers have argued that when the knowledge base that supports an industry is hard to comprehend, still emerging, and distributed across several organizations, then collaboration among firms, universities, and national laboratories will reflect a strong and fundamental interest in access to knowledge rather than simply strategic calculation, resource sharing, or transaction cost reduction.[51] This argument translates readily to policy challenges that span traditional jurisdictional boundaries. Internal expertise remains necessary to evaluate external research and development, but external relations facilitate access to new information and expertise that is not easily built within the firm. In policy areas that are

inherently cross-cutting, in which knowledge is distributed among agencies and other organizations, innovative capacity is located in the network rather than within individual agencies.

A central difference between distributed knowledge in economic and policy environments lies in the incentives for cooperation. Material benefits reward high-technology network actors that innovate well. Agency partnerships gain the reward of solving difficult policy problems that would otherwise fall between the cracks. But the ultimate reward is likely to be budget reductions, not profits, as synergies translate into the consolidation of organizations.

A zero-sum depiction, in which an agency gains only at the expense of others, inaccurately portrays the situation both in competitive industries and in government. It is far more accurate to view external relationships as a positive-sum game in which joint gains are realized and no actor in the network is disadvantaged. For example, few would suggest that the biotechnology industry is not characterized by fierce competition. Nevertheless, the competitors are more accurately described as competing networks of firms than as rivalries between individual firms. The collaboration required to stay abreast of technological and process advances, rather than diminishing competition, merely changes its character. This ability to preserve competition while encouraging cooperation to develop cross-cutting agency and policy capacity is one of the chief challenges underlying the move to G2G (government-to-government) web-based initiatives in the government. The central difference between sectors lies in the incentives and rewards for network formation.

Social Capital versus Informational Capital

Social capital is entirely different from "informational capital." Although open access to information, notably through the Internet, provides a variety of benefits, informational capital is not a replacement for social capital. Social capital provides decisionmakers with information benefits beyond access to shared information on the web. Useful access involves understanding who will benefit from specific information. It also involves screening information for accuracy, importance, and implications. Collaborative social networks perform this critical screening function.[52] Social capital encompasses not only shared access to information but also many positive properties of interdependence, including shared values, goals, and objectives; shared expertise and knowledge; shared work and decisionmaking; shared risk, accountability, and trust; and shared rewards.[53] Social capital increases the ability to build and use informational capital.

Actors in a collaborative network learn about new technologies, opportunities, the outcomes of transactions, and challenges more quickly because of the "density" of interaction within the network.[54] Learning is of a higher quality because it can be discussed and debated horizontally with people whose perspectives and backgrounds may differ. By contrast, vertically organized agencies tend to impede the organization's information-processing capacity. These are the externalities of bureaucracy that have been decried by critics: an inward, insular focus; secrecy and expectations of organizational loyalty that dampen information-sharing; centralized authority; and predominantly vertical flows of information, which tend to be slower, biased, and thus less reliable. The inability of the Central Intelligence Agency to accurately interpret events that led to the collapse of the former Soviet Union and the resistance of the State Department to change are but two of the more notable examples of bureaucratic inflexibility in government.

Understanding the differences in information flows between large, vertically integrated hierarchies and more horizontal structures is critical to understanding how social capital is built and maintained in the latter and how it leads to greater potential for innovation. Better environmental scanning and information flows and a relative lack of bias together amount to a greater capacity to adjust to change and to leverage new technologies in the network than within a hierarchy.

The Internet and Social Capital

Interorganizational networks, partnerships, and consortiums could not function at current levels without an electronic interface. However, the promise of information technologies for bringing about vast changes in structure, systems, and management has yet to be achieved—and may not be achieved.[55] Researchers consistently note that systems and structures resist change even when new information technologies offer the potential to increase efficiency. In order to take advantage of networked computing, organizations must have the ability to cooperate internally and with network partners.

The explosive growth of Internet use prompts another question: Can social capital be built using the Internet, or does it require face-to-face interaction? Currently, experts disagree about whether face-to-face interaction is necessary for the formation of trust and collaboration. Technology researchers celebrate the ability of information technology to make distance and time constraints virtually meaningless. However, most of the research that has been conducted on industry networks notes the importance

of geographic proximity. More empirical study is required to understand the potential for developing social capital in geographically distributed networks.

The federal government has been a prime force for investments in information infrastructure that promote interfirm networks.[56] However, these investments have not yet catalyzed extensive cross-agency networks in government. As we learn our way to a virtual state, the more difficult investments in information infrastructure for both the state and the economy will not be hardware but software and institution-building.

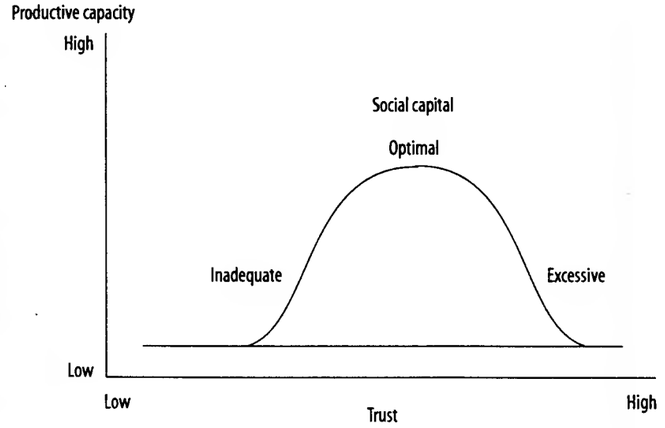
The Limitations of Social Capital

It is important to note that social capital—like its constituent elements, trust, norms, and networks—is inherently neither good nor bad. It is a tool that may be employed for legal or illegal purposes, for good or ill. Trust allows actors to engage in productive collaboration, but trust also provides a necessary condition for fraud and other illegal activities.[57] Norms decrease transaction costs and regulate behavior, but may stifle the creativity and diversity of opinion necessary for solving novel and complex problems.[58] Networks of firms collaborating to produce new technologies or applications widely report the benefits of cooperation; cartel members and organized crime syndicates also understand the benefits of network approaches to production and distribution. Social capital is a powerful resource that develops from productive social ties. How it is used depends entirely upon the values and objectives of the actors involved.[59]

Alejandro Portes and Julia Sensenbrenner have pointed out that in some communities characterized by close personal ties and deep norms of family and community loyalty rather than individual achievement, social capital causes economic advancement to be dampened, new ideas from outside the community to be rejected, and adaptation to changing conditions to be slow. Their research focuses on selected immigrant communities in the United States but serves to caution us that social capital is optimally productive when it is combined with critical thinking and competition.[60] When conditions are less than optimal—for example, when trust among network members is either too great or too small, or when social ties restrict sound decisionmaking—some types of productive capacity are diminished (see figure 5-1).

Perspectives that focus on transactions rather than networks alert us to the contingent character of cooperation among organizations in a network. Researchers should also differentiate between the development and

FIGURE 5-1. The Relationship between Social Capital and Trust



characteristics of voluntary interorganizational relationships and mandated networks, such as those that dominate relationships among levels of government. Power in networks is often conditioned on "organization size, control over the rules governing exchange of material resources and information, the ability to choose a 'do without' strategy, the effectiveness of coercive strategies, and the concentration of inputs."[61] Resource scarcity may lead some organizations to cooperate but leads others to attempt to control organizations that possess the resources they need. Thus although social capital is a powerful positive force in some interorganizational networks, it by no means characterizes all network relationships. The benefits of cooperation exhibited in some networks should not blind us to the enduring problems of power and resource distribution in interorganizational arrangements.

Conclusion

From this dissection of interorganizational networks we can propose that the Internet allows networked organizations to extend control and coordination more easily across organizations. Information technology does

not, and cannot by itself, create social capital or cooperation, in the absence of a base of trust; but if easier communication and coordination lead to enhanced trust, then the Internet contributes. The Internet does not, however, substitute for the development of social relations. A government that forces network formation but eschews collaboration may increase, rather than decrease, the costs of coordination. In such a scenario, poor institutional design, not technology, would be the culprit.

Interorganizational networks have emerged in response to large-scale technological, economic, social, and political change. They have not replaced hierarchies, or bureaucracies, as much as they have grown up within them and "sedimented" on top of them. Changes in bureaucracy that are likely to result from its juxtaposition with networks produce what might be called hyperarchy.[62] Hierarchy, in both the state and the economy, "the top-down pyramid, . . . still holds final rule."[63] Bureaucracy, "spew[s] out policies and procedures, rules and regulations."[64] Added to bureaucracy are networks of individuals, small groups and teams at all levels of organizations. Within bureaucracies, networks or teams (small groups) comprise what Herbert Simon called nested levels of activity.[65] Similarly, interorganizational networks are, simply, networks of bureaucratic organizations. This point is often missed by those who claim that bureaucracy is dead, outmoded, and no longer useful. The nation-state will require a large, complex bureaucracy for the foreseeable future. This sedimented view of organizational arrangements has to be reconciled with the simpler and more typical classification of organizational forms into hierarchy, market, and network. In looking at new and old forms in combination and in transition one can more clearly analyze the interaction and development of these forms as government officials work between them and their competing logics.

In many instances interorganizational relationships have been strengthened by the use of networked computing to link administrative systems, to share data, and to rapidly exchange information. In addition, social capital that has been strengthened by digital interorganizational communication can enhance reliability, flexibility, shared understanding, and long-term reciprocity, although these types of benefits are still difficult to quantify. For these reasons, the Internet is more likely to supplement rather than replace the knowledge gained in face-to-face professional relationships.

A rich stream of research has shown that economic relationships are embedded in social structures, or ongoing professional relationships, in which actors often benefit from the credibility, reliability, and flexibility

of their professional partners. Spot transactions and arm's-length relationships do not establish the critical social and informal elements that ongoing professional relationships do. Research on networked computing in government must take account of both the formal structures and ongoing social relations in networks.

Government decisionmakers, faced with the design and management of bureaucracy and cross-agency networks and networked computing, face institutional and governance questions of great complexity. Structures are in flux. The tensions between the logics of the bureaucracy, networks, and the Internet must be managed. Those tensions have barely been articulated or recognized. Over the past two decades, public and private sector organizations came under increasing pressure to rationalize horizontal flows of work and decisionmaking—that is, to work across traditional functional boundaries. As those organizations continue to develop new processes and establish cross-functional relationships, their learning will transfer directly to the more challenging tasks of interorganizational network development and governance across jurisdictional and functional boundaries.

Organizations also are under increasing pressure to develop relationships outside their organizational boundaries in order to leverage scarce resources, to capitalize on skills they do not possess internally, and to incorporate new technologies and policy innovations. This emerging trend in government will place pressure on oversight institutions to adjust to more horizontal forms of management. The American state will have to take up the challenge of redefining key institutions to align with networked forms of organization.

Because trust is a key component of successful collaborative networks, mandating the development of social capital is not likely to be a successful executive strategy. Executive orders cannot replace the more gradual development of norms, incentives, and trust that motivate employees and facilitate interagency network formation.

Technology enactment theory says that technology will be enacted to promote interorganizational networks, given their increasing use as an organizational arrangement in government. All networks are established in order to build or improve productive capacity, but networks with productive social capital are difficult to form and to maintain. Some researchers believe that calculations of self-interest and value maximization outweigh social relations as a reason to create networks; others believe that the social relations that undergird some networks provide a necessary

form of coherence in the absence of overarching governance. The competing influences on network formation, as well as the variety of interorganizational networks, are reminders that the outcomes of technology enactment are uncertain.

The Internet acts as a catalyst for the formation of interorganizational networks by providing a cheap, powerful infrastructure for communication and shared information. It puts pressure on organizations to form networks, but provides none of the social skills that networking requires. Interorganizational networks are sometimes composed of equals, but may have one powerful central player or a small elite coupled with others who rely on the central organization for resources and exchange. Thus networks vary greatly in structure and in how power and other resources are distributed.

It would be expected that powerful organizations in a network would seek to use the Internet to retain, or even gain, power. In other words, they would seek to perpetuate the status quo in enacting technology. In contrast, less powerful organizations in a network might use the rhetoric of collaboration and the powerful data-sharing capacity of networked computing to try to restructure a network to be more equitable in its resource distribution. These types of power struggles and negotiations characterize the enactment of information technology in government.

Sections of this chapter were originally published as "Social Capital: A Key Enabler of Innovation" in Lewis M. Branscomb and James H. Keller, *Investing in Innovation: Creating a Research and Innovation Policy That Works* (MIT Press, 1998).

CHAPTER SIX

Enacting Technology: An Institutional Perspective

BUREAUCRATIC POLITICS HAS produced the maxim: "Where you stand depends on where you sit."[1] Where a decisionmaker "sits" indicates not only his or her interests, but also how those interests are systematically influenced by institutions and one's structural position. Institutional actors tend to see the world from a particular vantage point colored greatly not by atomistic interests, but by interests and models that derive in part from structural position and ongoing social relations in networks.

In this chapter, I lay out the technology enactment framework. The analytical framework integrates information technology into organization theory and extends related research programs on institutions, social networks, and embeddedness in sociology, economics, and political science to better account for the behavior of bureaucrats in government agencies. The technology enactment framework increases our understanding of bureaucratic politics amid network formation and technological change.

I propose a framework that focuses attention on the relationship between information technology, organizations, embeddedness, and institutions. Before detailing technology enactment, however, I discuss some of the "shadow theories" to which it is an alternative. In each instance, these

partial theories cast some light on the subject but are deficient as satisfactory explanatory models.

Perspectives on Technology and Structure

An array of unexamined premises and assumptions, nearly invisible in most discussions of technology and structure but working in the background, form shadow theories that misinform decisionmaking and impede clarity of discussion. They include technological determinism, rational-actor perspectives, incrementalism, systems analysis, and individual and group perspectives.

According to the claims of technological determinism, technology acts autonomously upon individuals, social arrangements, and institutions. By reifying technology and its effects, researchers push to the background of their inquiry both the scope for action available to individuals and the complex interplay between technology, embeddedness, and behavior. Until recently, studies of technology's effects on the economy continually reported that expected productivity gains had not been produced. These discussions implied that information technology, by itself, would somehow lead to greater productivity without organizations having to make structural adjustments to fully integrate and use new technologies. These studies neglected to measure the ways in which technologies have been used by organizational actors, as if the technologies themselves were expected to provide economies.

Equally determinist, some students of technology argue that it has run amok, that technology is degrading society and robbing local communities of their vitality. Ongoing social relations and institutional arrangements are either reduced to passive objects following the imperatives of autonomous technology or treated as exogenous variables.

Several rational-actor theories—including functionalism, natural selection, and other frameworks that assume idealized rational action—have been used to explain the adoption and diffusion of new technologies. Implicit in these accounts is the assumption that, over time and through some degree of trial and error, organizations will choose the "best" technological offerings and learn to use information technologies in better and better ways. Rationality in individuals or collectively in the market will ensure that technological progress continues. Douglass North and others sharply criticize rationality assumptions in neoclassical economics that ignore the role of institutions.[2] A danger in this line of reasoning lies in the assumption that somehow learning will take place and that the "right" lessons will be learned. But actors may learn the "wrong" lessons and act for several years on those lessons. As North argues, path dependence exerts a potent influence on behavior through culture. It is easy to make poor choices because of uncertainty about how to use new technologies, and further, it is unclear that government or any other institution has corrective mechanisms in place that would illuminate them: "The greater the degree of monopoly power, the lower is the incentive to learn."[3] In the United States, the Congressional Office of Technology Assessment (now defunct) was established by Congress to help legislators make sound decisions regarding complex technologies by reducing uncertainties and promoting learning. Its demise removed an important source of learning from the federal government.

Political scientists often invoke incrementalism as a means of avoiding error in the policy process. Charles Lindblom and others argued that in practice policymakers take small, incremental steps or deviations from the status quo because small policy adjustments are easier to analyze, monitor, and correct than comprehensive, large-scale changes.[4] Although incrementalism might offer some degree of protection from error in decisions regarding technology, it does not prevent government actors from moving incrementally in the wrong direction. As a number of studies have shown, so-called path-dependent decision streams are those in which a course (or path), once chosen, is difficult to alter; thus a series of interrelated small decisions may take on a momentum of their own, propelling continued movement in harmful directions.

Research in psychology provides considerable evidence that commitment to a failing course of action often escalates through a series of small movements as decisionmakers become psychologically, economically, and politically committed to it.[5] In these instances, actors find it increasingly difficult to alter course even in the face of negative feedback. In addition, economic sunk costs—time, energy, and money spent on a course of action—make decisionmakers reluctant to change direction. In the case of large, complex information systems, the economic sunk costs are enormous and each subsequent decision is highly path dependent. It is costly and difficult to reconfigure, rebuild, modernize, or otherwise substantially change information systems.[6] Thus incrementalism offers only limited guidance for constructing a digital government.

Systems perspectives have offered useful analogies for the exploration of technology and complex organizations.[7] Yet an often-employed term

from systems analysis, "institutional lag," implies that social systems must—and should—somehow catch up to new technologies. To say that institutions lag behind changes in technology implies a normative judgment that actors and structures should adjust more swiftly and efficiently to technological advancement, as the cart should follow the horse. An additional implication is that new developments in technology should always be adopted and as rapidly as possible. Several social lags on change may be identified. Human cognition requires some degree of stability and so tends to lag behind environmental changes in an effort to retain cognitive balance. Political regimes resist changes that would alter the power of those in control. A fine mesh of institutional entailments envelop and create structural inertia in large organizations.[8] Their number and interdependencies render change complex and necessarily slow. A systems perspective on technological change ignores these and other social structural processes.

The high failure rate of business process reengineering—a management movement that directed rapid, deep structural change to leverage new technological potential—exemplifies the need to attend to social and political structures, organizations, and networks.[9] Paradoxically, many researchers conclude that technology has failed when expected improvements in productivity or organizational design fail to take place. Other analysts invoke organizational lag to explain a similar absence of the hypothesized direct effects of technology.

The scale of government organizations is enormous. The relative scale and complexity of the tasks performed by the federal government renders integration of new information technologies exceedingly difficult. Government procurement of new information technologies remains slow and cumbersome despite legislation designed to streamline information technology (IT) procurement and to provide technology leadership within agencies. Scarce resources in government make IT-based innovation difficult to undertake. Systems perspectives fail to account for the mediating links in the chain that presumably connects information technologies to organizational change.

Early studies that attempted to explain the effects of IT on organizational structure drew strongly from social psychology and communications research. One stream focused on the hypothesized effects of information technology on individual-level variables such as employee satisfaction, performance, and discretion. Other studies have attempted to measure the effects of individual variables, such as the level of user

involvement during implementation of new information systems, on the probability and degree of success.[10] This individual-level perspective is meant to yield models that build upward from the effects of technology on organizational actors to structural change.[11] Research results employing this approach have been inconclusive and contradictory. At times, research designs have been weak. Different, noncomparable technologies have been compared as if they were similar. But most important, the models have not conceptualized the processes by which change occurs.[12] The assumption that technology works autonomously has plagued causal studies of this type.

As a result, several students of information technology and organizations began to focus on structural analysis at the level of the organization. These studies attempted to measure the direct effect of IT on structural attributes such as authority relations, task structure, and employee autonomy. But early studies of every hypothesized direct relationship between technology and structure also have produced contradictory findings. Both streams of research indicated that detailed examination of the dynamics that link technology and structure might generate more fruitful results.A small number of researchers began to reconceptualize the study of technology and structure by drawing from other theoretical perspectives. These more structural approaches began to point to flexibility in both the design (architecture) and use of information systems and organizational arrangements that challenged more determinist perspectives.[13]

Stephen Barley argued that the typically weak and contradictory findings of contingency theories could be explained by an alternative conceptualization in which "technologies are . . . viewed as occasions that trigger social dynamics which, in turn, modify or maintain an organization's contours."[14] Barley's account expanded on the popular reengineering theme that information technology is an "enabler" of organizational change. Thus the same information system implemented in similar organizational contexts may contribute to the implementation of different structures. Barley used interpretive and institutional perspectives to redefine the key concepts of technology and structure. Technology is an entity whose attributes are at least partly socially constructed. Structure is a set of processes more fluid than previous definitions had allowed. Barley traced the effects of a digital radiology system on analyst and operator tasks and skills and, as a consequence, on relations between functional roles.[15] According to the model, technology either modifies or reinforces role relations and through these relations occasions either structural change or

maintenance. His project, though highly useful, leaves key questions unanswered. Although Barley theorized role change in detail, he left open the theoretical details of structural change. In focusing on roles and role relationships, the model left the examination of organizational mechanisms, such as performance programs and operating procedures, to other researchers. Finally, the model ignores the political or strategic behavior of actors in the context of new technologies. Technology enactment theory contributes partial answers to some of these unanswered questions.

Each of these perspectives contributes to an understanding of technology and structure, but each omits critical elements that are included in the technology enactment framework. Institutional and embeddedness perspectives, extended and refined to account for information technologies and their interrelationship with organizational and institutional arrangements, point toward a more complete and powerful explanatory framework than the partial theories summarized here.

Enacting Technology: An Analytical Framework

The technology enactment framework invites us to reverse the direction of the causal arrow that lies between technology and structure to show how the embeddedness of government actors in cognitive, cultural, social, and institutional structures influences the design, perceptions, and uses of the Internet and related IT. Individuals perceive, and therefore define and use, IT in subjective ways. Most individuals and organizations use only a few of the functions and features of their hardware, software, and telecommunications capacity. Consider those who use their personal computer only as a "smart" typewriter—that is, as a word-processing machine. And most people use groupware such as Lotus Notes, a sophisticated group problem-solving software package, as a tool merely for sending and receiving electronic mail.

It follows logically that information technology may be described in its objective sense, that is, in terms of the capacity and functionality of hardware, software, telecommunications, or digital devices. But the material components of technology represent a potential capability that is of little practical value to an individual or an organization until knowledgeable agents use them. Organizations are just beginning to formulate designs and uses that incorporate the Internet and web into their operations and structures. Organizations rarely use the full capability of their information systems, and they do not often leverage their strategic potential.[16]

Indeed, many organizational actors are scarcely aware of the potential of their technological systems. It is not surprising, therefore, that similar organizations may use identical information systems in vastly different ways. It follows that the capability and potential of an information system are enacted by the users of the system. Individuals and organizations enact information technology by their interpretation, design, implementation, and use of it in their organizations and networks. The flexibility, decomposability, and functionality of the web and related information technologies mean that a system's objective characteristics may differ substantially from those that are actually used.

Technology enactment is the result of cognitive, cultural, structural, and political embeddedness. Enactment is similar to "the definition of the situation," or the subjective representation of a problem that reflects an actor's perception and boundedly rational reasoning rather than the situation itself. Social scientists from W. I. Thomas to James March and Herbert Simon and, more recently, Douglass North, have employed the concept to connote the selectivity with which individuals perceive and frame, or make sense of, stimuli in their environment due to cognitive and social constraints.[17]

Organization theorists have used the term *enactment* to refer to the selective attention paid by individuals to environmental stimuli; the propensity to represent, act out, or enact institutionalized (or routinized) performance processes and standardized organizational arrangements; and the construction of organizational life that results from conflicting, competing, and sedimented enactments.[18] The Internet, and decisions regarding its use in organizations and institutions by nontechnical decisionmakers, is a quintessential example of decisionmaking under uncertainty. Uncertainty pertains to the technology itself as well as the future effects of its use on individuals, organizations, and institutions.

The analytical framework details the ways that individuals in institutions tend to enact new information systems to reproduce existing rules, routines, norms, and power relations if institutional rules are clear and no salient alternative uses are visible in the environment.[19] This conceptual framework illuminates the critical role played by sociostructural mechanisms in organizational and institutional arrangements as public managers struggle to make sense of, design, and use new IT.

The technology enactment framework extends the logic of embeddedness to the issue of the Internet and organizations. Cognition, culture, social networks, and formal rule regimes shape perceptions, interests and behavior.

Individuals often enact existing performance routines and network relationships in the way they design and use web-based information and communication systems. But the unintended consequences of these enactments occasionally lead to subtle modifications of structure to accommodate new technology. The accumulation of unintended, subtle modifications may lead to more dramatic shifts in structure and power, but actual outcomes are indeterminate in the enactment framework (see figure 6-1).

Three general propositions of the technology enactment framework are explained and illustrated below. A set of more specific propositions follows later in this chapter. The three propositions follow from the initial observation that enacted technology differs from objective technology. The process of enacting technology refers to the tendency of some organizational actors to implement new IT in ways that reproduce, indeed strengthen, institutionalized sociostructural mechanisms even when such enactments do not use technology rationally or optimally. Organizational actors tend to enact technology to preserve ongoing social, or network, relationships and to maintain performance programs: the routines, scripts, frames, and patterns that constitute the typical "organized set of responses" within organizations. More entrepreneurial or visionary professionals might use the Internet to develop new networked organizational forms or new capacity typically through a mimetic process that operates within social networks.[20]

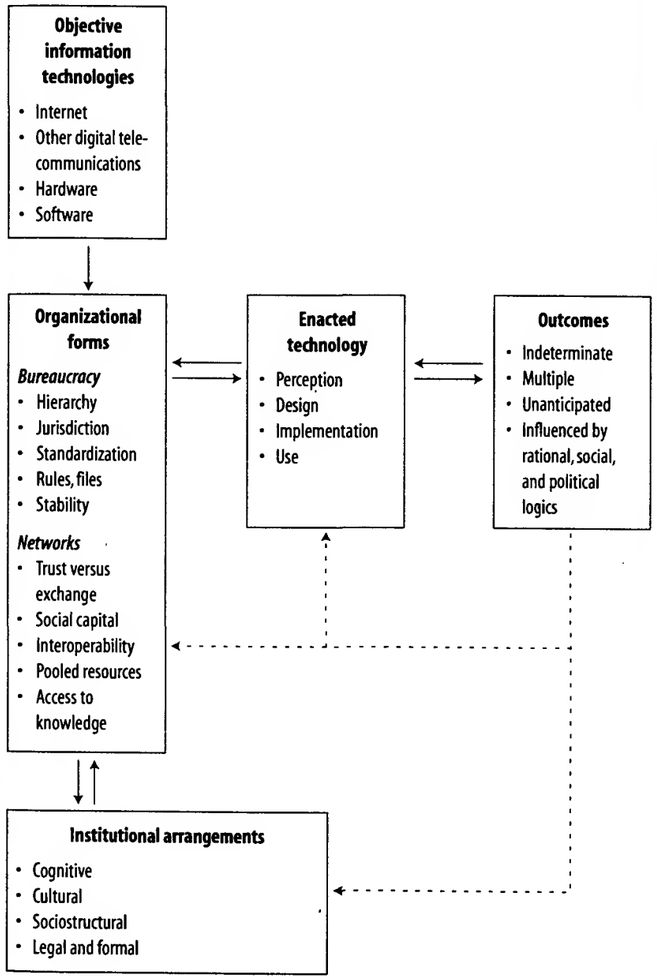
Knowledgeable actors try to pursue their interests in enacting technology. However, their interests are influenced by their organizational tasks, incentive structure, and ongoing social (network) relations. Finally, institutional actors tend to enact new technologies in ways they hope will sustain or strengthen what I call "deep institutions," history and culture encoded in the existing norms and values of an organization.

Chapters 2 and 3 examined enactments of IT in American government in the 1990s. Chapters 4 and 5 analyzed the central elements of two predominant organizational forms, bureaucracy and interorganizational networks. But what of institutions?

Institutions and Embeddedness

In *TVA and the Grass Roots*, a case study of a new government organization in a complex political environment, Philip Selznick examined from an institutional perspective how a complex organization must adapt to its environment in order to secure the legitimacy and resources needed to

FIGURE 6-1. Technology Enactment: An Analytical Framework



survive. In the process of adapting, organizations may shift their mission or objectives. The Tennessee Valley Authority, a newcomer to the federal government, "adopted strategies that decisively affected its capacity to uphold standards of environmental protection and, in the early years, its willingness to reach out to poor blacks and farm tenants."[21] Building on this study of the development and character of organizational competence, Selznick distinguished "organizations" from "institutions," noting the propensity of some organizations to take on a particular character or competence over time. He defined the process of institutionalization as "the emergence of orderly, stable, socially integrating patterns out of unstable, loosely organized, or narrowly technical activities."[22] In some instances the patterns that emerge are highly productive; in others, a learned incapacity or blinders may develop.

How would a decisionmaker know when a pattern had become institutionalized? The traditional test, according to Selznick, is expendability, or the ease with which an organization or practice could be modified or given up when environmental shifts or changes of circumstances demanded. Institutions typically grow out of social commitments made by people acting within social networks. Selznick observes:

> The underlying reality—the basic source of stability and integration—is the creation of social entanglements or commitments. Most of what we do in everyday life is mercifully free and reversible. But when actions touch important issues and salient values or when they are embedded in networks of interdependence, options are more limited. Institutionalization constrains conduct in two main ways: By bringing it within a normative order, and by making it hostage to its own history.[23]

Interrelated norms and social relations form a context within which choice and problem-solving take place. This context influences choice, as well as every step preceding choice: the recognition and formulation of problems, the development of preferences and interests, which problems are put on the agenda for attention, the criteria for analysis, the participants in the problem-solving process, and the roles they will play. Rational-choice perspectives drawn from neoclassical economics paint a portrait of atomized choice apart from its context. Institutions are constraints on choice and frame how those constraints operate.

Sharon Zukin and Paul DiMaggio classified the constraints and rule regimes that form institutions, or embeddedness, into four types, which

are highly interrelated and distinct only analytically.[24] At the micro level, procedures, habits, and cognitive patterns are institutional instruments when they are widely shared and largely taken for granted. Cultural elements—including stories, myths, symbols, rituals, and worldviews—function as sources of embeddedness when they form part of the belief systems of actors and shape behavior, preferences, and calculations of effectiveness or efficiency. My framework employs culture not only as belief system but also as a "'tool kit' of symbols, stories, ritual and world-views, which people may use in varying configurations to solve different kinds of problems."[25] Thus "multiple and competing versions of institutionalized belief systems" can be selected and used strategically by organizations and policymakers.[26] The environment in which agencies operate consists of interorganizational systems that include other agencies, other branches of government, economic actors, and other interest groups. Although some relationships at this level are formalized, many are less formal ongoing social relations. Granovetter argued that economic action is embedded in ongoing social networks. His argument may be extended, at least hypothetically, to technology enactment. Finally, all organizations function in legal, regulatory, and political environments that consist of hundreds of rule systems, some of which are contradictory. So, the behavior of bureaucratic decisionmakers is embedded in four ways, through cognition, culture, social structure, and formal government systems.[27]

Related research streams in institutional analysis and embeddedness leave several questions unanswered. To what extent and in what ways does structure constrain action? How do constraints change over time? Who or what changes them? What is the role of power in the creation and maintenance of institutions? Do constraints differ systematically for actors depending upon their power? How or why do some individuals and organizations conform to rules while others either innovate, skirt the rules, behave strategically, or otherwise transcend conformity and habit?

During periods of stability, institutions are taken for granted. But when environmental shifts occur, including economic, political, or technological "shocks," crises, or revolutions, institutions are less resistant to change. Communism in the former Soviet Union gave way in a peaceful revolution after a long period of weakening within, catalyzed by environmental shifts. Career ladders in professions have given way to the portable assets of professionals increasingly moving from one organization to the next. Marriage, certainly a deep social institution, falls apart nearly 40 percent of the time in Western society. Myths, symbols, and rituals such as family,

religion, patriotism, cooperation, partnership, innovation, standardization, and efficiency constrain action but also are tools that political actors manipulate with regularity and skill.

The Interplay of Action and Structure

Early studies in the institutional perspective were unable to account for organizational and institutional change and strategic action by individuals. Structure and institutions were viewed as both "fixed" and "external" to social actors and thus as a constraint on cognition and choice.[28] More recently, institutions and structure have been conceptualized as enablers of, as well as constraints on, behavior. This "duality of structure" thus links action and structure. In other words, individual action is constrained by structure, but it is action that maintains and modifies structure.[29]

In this sense, institutions can be defined simply as "reproduced practices" that are both flexible and remarkably stable. Giddens, followed by some new institutional theorists, argued that "a sophisticated understanding of agency" is necessary to comprehend structure. The reflective capacity of agents, their constant monitoring and indexing of behavior against standards of appropriateness and the pursuit of interests, for example, diminishes the unshakable constraints of institutions. In this view, "even the most enduring of habits, or the most unshakable of social norms, involves continual and detailed reflexive attention." Routinization, as we saw in Chapters 4 and 5, is of "elemental importance in social life; but all routines, all the time, are contingent and potentially fragile accomplishments."[30] Informal rules, in particular, remain in effect only to the extent that, and as long as, people decide to follow them.

Others have explained the duality of structure using cognitive science to characterize some institutions as production systems—that is, sets of production or if-then rules that structure standardized interactional sequences.[31] The value of the production system model for representing institutions as rule regimes stems from its ability to explain how departures from accepted rules are treated. A routine may be said to be institutionalized only when "departures from the patterns are counteracted in a regulated fashion, by repetitively activated, socially constructed, controls—that is, by some set of rewards and sanctions . . . [I]nstitutions are those social patterns that, when chronically reproduced, owe their survival to relatively self-activating social processes."[32] This account allows for organizational change only through external shocks to the system or through collective action organized to block reproduction of an institutionalized process.

Other theorists allow greater scope for organizational change. Giddens emphasizes the key role played by the unintended consequences of behavior in modifying institutionalized structures. March and Olsen and others have noted the contradictions in collective and individual behavior that result from multiplicity and conflicts among complex systems of rules within organizations. Granovetter and other researchers focus on behavior influenced, but not determined, by institutions and network embeddedness.[33]

Insights from cognitive science help to explain adherence to routine and norms, as well as deviations from them. Insights including selective attention and search; limitations of perception; the centrality of scripts, schemas, routines, and performance programs; and the variety of unanticipated consequences of rule-based behavior explain departures from rationality and, ironically, departures from institutional constraints as well.[34]

Drawing from cognitive psychology, organizational analysts have advanced an understanding of the relationship between action and institution using the distinctly cognitive organizing structure of scripts but using "grammars" to portray flexibility within scripted behavior. Research in this stream reiterates the critical position of routines as intermediate structural elements mediating between institution and action but details the use of "rule-based, grammatical models" of routines to capture both structure and agency and to convey the stability of rule systems as well as the flexibility of each performance of a routine. In this view, "Members enact specific performances from among a constrained, but potentially large, set of possibilities that can be described by a grammar, giving rise to the regular patterns of action we label routines."[35] Similarly, researchers have reconceptualized the bureaucratic notion of communication channels as elements of formal structure to be more fluid "genres of organizational communication."[36] Repertoires of meetings, forms, memos, correspondence, and training formats simultaneously constrain and enable action. Their enactment reflects and reconstitutes the ongoing accomplishment of structure. New institutional economists tend to ignore these fine-grained sources of flexibility and change, focusing instead on the pursuit of interests with constraints.

The important insights of the Carnegie school that stem from viewing organizations as interdependent and partially consistent production systems complement negotiated order theory's view of the fluidity of structure and the processual nature of scripted behaviors. Together, these images

yield powerful insight into stability and change within organizations and networks. They also provide us with the "hooks" upon which organizational actors hang elements of enacted technology.

Even theorists who emphasize rational choice in social networks note the fluidity of structure. In this view, institutions also shape choice through a series of "social mechanisms" or "processes that are built into ongoing social relationships—the domain of network analysis in sociology." Nee and Ingram argue that "by structuring social interactions . . . institutions produce group performance" from the micro level of the family, to the large organization, and the economy as a whole: "Networks of social relations are always in flux insofar as individuals respond to perceptions of costs and benefits in exchanges, and invest or divest themselves of particular social ties. The production and monitoring of norms, standards of expected behavior that enjoy a high degree of consensus within a group or community, are rooted in such elementary forms of social behavior."[37] Norms relate directly to incentive structures, the rewards and sanctions that further influence social behavior. Formal norms operate explicitly through rules and are reinforced through the monitoring and enforcement efforts of, for example, individual organizations and the state. Informal norms, the rules adopted and adhered to by a group, may be explicit but are often implicit. They are enforced through social mechanisms, including approval, acceptance, disapproval, avoidance, and shunning.

The institutionalization of key elements of organizational structure helps to explain its surprising resilience in the face of disruptive information and communications technologies. The stability of organizational forms demonstrates the importance of an institutional perspective in a terrain that remains dominated by the assumption that information technology determines structure. Society has entered the information age with major structural changes attending technological change. However, it is erroneous to attribute structural change directly to technology. Organizational, network, and institutional arrangements—and the embeddedness of behavior in them—play key roles in technology enactment.

Embeddedness and Technology Enactment

Those who celebrate the integrative power of the Internet rarely consider the complexities required to develop and manage interorganizational networks, including the intricate balance between trust and interests and between cooperation and competition.[38] Most discussions of digital government do not adequately take account of research on social and interorganizational networks. Yet it follows as a logical consequence of these research findings that technology enactment and organizational change, catalyzed by the Internet and related technologies, must follow similar patterns. Absent theories that connect the logic of networked computing with that of institutions, researchers and practitioners are left without sufficiently realistic analytic frameworks. The decoupling of embeddedness and its effects on action and institutions from models of technological change produces an erroneous, overly simplified view of the Internet and its likely uses in a society of complex organizations.

In the public sector, as in the private, three aspects of technological change have contributed to an increase in network formation. First, there has been significant growth in the base of technologies that agencies might use. Many new government services and policy instruments combine disparate technologies. For example, a geographic information system (GIS) requires large capital expenditures and technical experts. But the benefits of data generated by a GIS spill over to environmental regulation, economic development, housing, law enforcement, and other policy areas. Second, single agencies cannot maintain proficiency in all the technical fields relevant to their policy domain. Moreover, it is not feasible for single agencies to attempt to develop those proficiencies in-house because, as policymaking becomes more complex and uses combinations of new technologies, agencies will increasingly face pressures to coordinate with other sources of expertise and knowledge. Third, the rapid pace of technological change makes it increasingly difficult for any single agency to keep up with all relevant technologies.[39]

The Internet creates far-reaching possibilities for interorganizational networks. Although technologically determinist, Mark Ackerman emphasizes the potential of the Internet to allow new types of networks:

> Software can construct more flexible expertise networks than society could sustain previously. This new flexibility can change the way we produce, disseminate, and store society's knowledge. Within these networks, moreover, we have the flexibility to include information databases, documents, agents, and people together as resources. And as interesting, the same software allows emergent networks to be used for political action, hobbies, a sense of community, and other forms of social life that we can barely imagine. The standard forms, and even the vocabulary we use to describe the forms, will blur even more.[40]

But even Ackerman allows that "Our ability to design technically far exceeds our understanding of what socially needs to be incorporated into a design."[41]

In sum, objective technology includes the Internet, other networked computing systems and telecommunications, hardware, software, and digital devices. Enacted technology is the perception, design, and use of objective technologies. Organizational and institutional arrangements, dissected in this and the previous two chapters, include the bureaucratic and network forms of organization and the institutional logics discussed here. The bureaucratic form, whose logics—particularly standardization, the primacy of rules, and control—remain robust, exhibits some changes due to technology, as we saw in Chapter 4. In contrast, because interorganizational networks follow different internal logics, they find coherence and governance in norms, trust, and the structure of network ties rather than in hierarchy and command-and-control systems. Some network forms appear to offer greater flexibility, access to knowledge, and adaptability than bureaucracies.[42]

Thus institutions influence and are influenced by enacted information technologies and predominant organizational forms. Institutions enter the technology enactment framework in the form of cognitive, cultural, sociostructural, and formal embeddedness. The outcomes of technology enactment are therefore multiple, unpredictable, and indeterminate. Outcomes result from technological, rational, social, and political logics.

The Virtual Agency

As a concrete application of the technology enactment framework, I focus on the virtual agency. The virtual state, as I noted in the first chapter, denotes a government in which information and communication flow increasingly over the web rather than through bureaucratic and other formal channels. The restructuring of agency services and information in portals sometimes makes it difficult for citizens to know which agency they are dealing with. Moreover, the distinction between government and business may be blurred on the web because both the public and the private sector provide government services, increasingly through the same portals. My analysis focuses on structural change in the federal bureaucracy, a relatively neglected but vitally important area of governance and policymaking. The technology enactment framework could be applied,

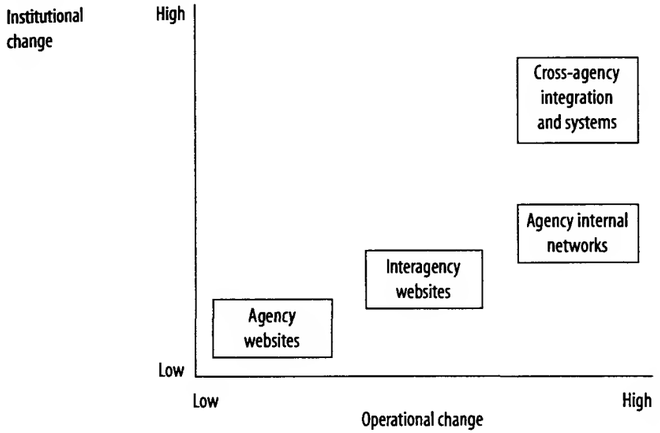
with modification, to the Internet and its uses in electoral politics, Congress, the judiciary, state and local politics, intergovernmental relations, and international affairs. The virtual state is one in which the organization of the government increasingly resides within networked computerized information systems and within interorganizational networks rather than in autonomous bureaucratic agencies. A virtual state consists of virtual agencies overlaid on a formal bureaucratic structure. Such a state will depart from the bureaucratic state as the formal institutions that structure oversight and the budget process are modified to align with the logic of web-based policy networks.

The term *virtual agency* has been given to a number of innovative agency arrangements. These range from agency websites to interagency websites organized by client group or policy domain—such as financenet, Access America for Students, and the U.S. Business Advisor—to more complex cross-agency systems such as the International Trade Data System. The virtual agency, in its many forms, represents an emergent structural change in the American state that roughly parallels structural changes in the economy, including the growth of interfirm networks.

The term *virtual agency* describes at least four different enactments of the Internet and related technologies by government agencies. For a graphic depiction of the relationship between virtual agencies, operational complexity, and institutional barriers, see figure 6-2. First, agencies have produced single-agency websites that make government information available to anyone in the world with an Internet connection and web browser. In most cases, these websites have had little impact on internal agency structure, culture, and power.

Second, groups of agencies linked by common clients, such as students or senior citizens, have developed virtual agencies. These virtual agencies use the connectivity of the web to co-locate the information and transactions of several agencies on one website. So, for example, a senior citizen using the Access America for Seniors website will find information from several agencies and can download forms or perform simple transactions with them.[43] A visitor to the Wilderness Information Network will find the resources of five federal agencies with jurisdiction over wilderness management as well as information from a host of other organizations in the public, private, and nonprofit sectors.[44] The integration of information across agencies in these examples consists of website design decisions only. Each website makes it easier for users to find information, regardless of its actual agency location. But the agencies themselves have

FIGURE 6-2. Virtual Agencies and Ease of Implementation



not modified or integrated what designers call "back channels," their procedures or systems.

A third type of site is the intranet within an agency. This type of integration and networking is often more complex than the interagency website because of the requirement to integrate performance programs and other internal structural arrangements. Chapter 9 analyzes the development of a complex intranet enacted in a traditional command-and-control organization, the U.S. Army.

Fourth, a virtual agency may consist of a group of agencies that integrate some of their activities both on the web and "behind" the website, within and across the structures of the agencies themselves. At this level, the Internet is a catalyst and an enabler for restructuring agency processes, information systems, and procedures to achieve partial integration within the network of agencies involved. Clearly, this fourth level requires a great deal of operational, political, and institutional change. It is at this level that institutional barriers to interagency networks become evident and significant.

Virtual agencies are nothing more than organizations connected by networked computers and linked on the screen by means of a web-based user interface that presents a seamless image to the outside world. For example, the customer of Acme Advertising (a fictitious virtual agency) may not realize that the "firm" is nothing more than an individual and several contractors. The Virtual Department of Business, an important innovation of the National Performance Review examined in Chapter 8, is in one sense nothing more than a website that includes all the government information and services for business, spanning several agencies located "virtually" in one website.

In the federal government, virtual agencies operate in a heavily institutionalized setting where historical, cultural, and professional norms of good government, sound administration, and efficient public management are formalized in legislation and rule-making; in the structure and processes of the federal budget process; in oversight arrangements within the Office of Management and Budget, the Congressional Budget Office, and the General Accounting Office; in relationships between the executive and legislative branches; and in the socialization and reward systems of career public servants. Agencies are embedded in an institutional environment that discourages horizontal cross-agency initiatives and that encourages competition among autonomous agencies for resources. Thus, in contrast to the economic firms in the market, government agencies face strong institutional constraints on network formation in the form of oversight relationships, the budget process, and a long tradition of adversarial bureaucratic politics. The incentive of profits and economic success that accrues to firms that form wise strategic alliances in the private sector is not available in government. On the contrary, efficiency gains from networking across agencies are likely to result in the loss of budget, staff, and even agency jurisdiction. These disincentives to the development of cross-agency networks contrast sharply with the networking logic of the Internet or the logic of networks of organizations that benefit from cooperation.

Although the technological logic of networked computing suggests that networks of organizations are a logical and natural outgrowth of the Internet, this claim ignores the embeddedness of economic action in social, political, organizational, and institutional life. Technological logic must be connected to, and integrated with, the logics of the institutions and social relations that constitute interorganizational networks. Virtual agencies succeed only when the agencies involved can develop and maintain social capital. Although the Internet provides the potential for vastly

improved communication across organizational boundaries, these benefits are realized only when embedded in appropriate cognitive, cultural, social, and formal norms, rules, and relationships.

The technology enactment framework suggests a set of guiding propositions for interactions among technology, organizations, institutions, and individuals. I offer additional propositions here as a scaffolding to support research and theory-building. These propositions are "tested" in an exploratory manner against the case studies that follow.

Proposition 1: Government agencies will resist the potential for dramatic efficiency gains if those gains translate into loss of resources (budget and personnel) for the agency. As I noted in Chapter 1, agencies are highly likely to lose budget and personnel through their enactment of the Internet. The logics of technological advancement and rationalization conflict with the logics of bureaucratic politics.

Proposition 2: Federal interagency networks will be difficult to build and maintain because the formal institutions of the federal government reward agency-centered activities and discourage cross-agency activities. There are few processes in place for evaluating or advancing cross-agency activities (action channels, templates, models, rule regimes).

Proposition 3: Agencies lack resources for learning to use IT. The current cost-cutting environment in the federal government, which demands immediate cost savings from information technology expenditures, makes it difficult for agencies to develop prototypes and to pilot new information systems. The learning curve government managers must climb in any new initiative is steep, as are the costs of organizational restructuring. The requirements for agency learning suggest that some IT appropriations should be viewed as investments rather than expenditures and should not be traded off in the budget process with other classes of expenditures.

Proposition 4: Intergovernmental and public-private networks will overshadow cross-agency IT-based networks because the institutional context favors those arrangements more readily than cross-agency federal networks.

Proposition 5: Agencies are likely to focus reform efforts on constituents, or "customers," who also are potential or actual strategic allies in the appropriations process. Large interagency initiatives have redistributive effects; and some constituencies are likely to benefit more than others, depending upon the enactment of web-based interagency networks. Such a bias toward serving the public interest is an unanticipated outcome of customer service norms in government.[45] Customers with little political influence are likely to receive fewer benefits of the Internet from government restructuring.

Proposition 6: The nature of changes necessary to develop a network will affect the probability of success of the effort. Cross-agency IT efforts that require standardization of data are more likely to succeed than projects whose success requires structural change in the agency or its network ties. This proposition follows from the dissection of technology, as well as from organizational and institutional logics.

Proposition 7: The culture, history, mental models, and standard practices of a policy domain or agency will affect technology enactment—that is, whether and how an agency uses the Internet. Agencies involved in science and technology activities are more likely to engage in network arrangements than agencies with less exposure to science, technology, computing, or cross-jurisdictional collaboration. This proposition follows from our discussion of culture, history, and professional practice as elements of embeddedness.

The technology enactment framework can be used to address a broad range of research questions and to develop a much more elaborate set of expectations. The initial sketch of propositions is limited to those that explicitly explore the data that follow. As noted previously, the analytic framework could be used to analyze a variety of policy networks at the transnational, federal, state, or local levels of government. Similarly, it extends to the judiciary and the Congress.

What difference does networked computing make to these propositions? Networked computing acts to pressure political entrepreneurs to seek out uses of the Internet that ultimately involve networked agencies because networks economize on time, resources, and information. This pressure may be in the form of external actors in the authorizing environment who promote the use of the Internet. Through the reinventing government effort, the Clinton White House played a chief catalytic role in fostering certain enactments of information technology. Congress might play a similar role. The federal government tends to imitate the private sector, particularly when influenced by outside contractors, consultants, political appointees from business, and the popular media. As networked computing becomes a bigger part of the government infrastructure, more and more policy entrepreneurs will take its growing acceptance as an invitation to increase their agencies' resources, capacity, or responsiveness. As institutional, technological, social, and political logics collide and are negotiated, so the virtual state will be built.